



## Impact of War, in Swat Region (Social and Environmental perspective)

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### ABSTRACT

The main objective of the study is to assess the nature, magnitude and extent of the environmental and social impacts of the conflict in swat valley. Current study is conducted in order to assess the damage done to the social lives of the local population and to local environment. For this purpose number of field visits was conducted in the area and two sampling campaigns were done in wet and dry seasons. Surface and Ground water samples were collected in dry and wet seasons from the affected villages in order to determine the damage done to water quality due to the conflict. Soil samples were collected from six different villages in the Mata district of Swat Pakistan. Six different impact points of bombing were selected which were still undisturbed by the local residence. Total of 270 questioners were also filled on the basis of 94% confidence level and 6 % error from the six selected villages. The negative impacts of military operation on the social lives of local residents were very much evident from the current study. Environment has also paid its price in term of burned forest and decrease in local wild life but overall the water and soil quality is not been disturbed and no traces of TNT were found in the soil and water.

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### Introduction

Historians have highlighted modern technology in reshaping the impacts of warfare, particularly its impact on military personals and rest of civilian population. The increasingly destructive capacity of modern technology changes the way of traditional warfare and increase the level of destruction caused to the socioeconomics and infrastructure of societies affected. Now a day's war in terms of scope and impacts are becoming intra-state and involving more civilian casualties. Matta has always been strong holds of militants from start of conflict and has a great importance from military's point of view. In 2009 Government of KPK has conducted a survey of the Swat area but the main shortcoming they mentioned in this study was that they cannot conduct survey in Matta due to security threats. The proposed study will not only generate the data on the magnitude of the military operation impact on the soil, water and social life of common man but will also be useful for studying and predicting the impacts of military operation in the different regions of world with similar socio-economic, topographical and environmental conditions.

The main objective of the study is to assess the nature, magnitude and extent of the environmental and social impacts of the conflict in swat valley. This will be achieved by concentrating on the following specific objectives:

- Assessment of social impacts of operation and damage done in Swat.
- Analysis of water and soil quality after the operation as well as reference zones of these resources where there had been no military operation.

#### Literature Review:

The effects of the civil wars generally extend beyond the borders of the conflicted states. Javier and Baez (2007) studied the socioeconomic effects of the genocide of Rwanda and Burundi on Kegara -a north western state of Tanzania. Due to

the civil conflicts many people died and others migrated to the neighboring states.

Husain (1998) investigated the impacts of Gulf War (during & after the war) on the terrestrial & atmospheric environment as a result of Kuwaiti oil fires. This research study also focused on investigating the impacts of different pollutants on human health & marine environment. Severe malfunctioning of lungs, Asthma, distasteful odor, increased airway resistance, chronic cough & mucus secretion resulted due to the inhalation of the pollutants released from the Kuwaiti oil fires.

Hendrex & Glaser (2007) investigated trends, triggers, climate & climate change due to the civil conflict in Sub Saharan Africa. Climate change due to the conflict focused on long term trends in temperature and precipitation that define ecosystems and their impacts on the renewable resources. Because these changes occurred over long period of time that may not had captured the factors that trigger conflict.

Vazquez *et al.*, (2000) focused on investigating the long term effects of 1991 Gulf War on the Hydrocarbon levels in Clams at the selected areas of the Saudi Arabian Gulf Coastline. For this purpose the hydrocarbon levels for the period from 1981 to 1990 in the clam at the different selected locations along the Gulf coastline of the Saudi Arabia were compared to those from the war & the post war periods. Results of the study revealed that five sites i.e. Safaniya Bay, Tanajib Bay, Manifa Bay, Ras Az Zawr and Abu Ali North out of nine selected sites of the study area i.e. the Gulf coastline of the Saudi Arabia were affected by the war oil spill. Normal hydrocarbons, aromatic hydrocarbons and crude oil biomarkers were found in samples from all the sites. N-alkane had no significant impacts. For the 1991-93 periods there was a small decrease in the average n-alkanes values at Safaniya and a larger one at Ras Az Zawr suggesting a reduction in the hydrocarbon input at these sites. However dibenzothiophenes and phenanthrenes increased significantly in the clam during the war period. These values

returned to pre-war levels after a short period of time i.e. within two years. The data of the affected sites were compared with that of the four unaffected sites of the study areas.

Patrick et al (2008) conducted a study on physiological effects of Israel- Hezbollah War on Jews and Arab residents of Israel. Israel is facing many rocket attacks across the border from Hezbollah in past many years. These rocket attacks mainly affect the southern part of Israel and as a result many civilian populations are evacuated from the area. These attacks on the Israel cause many social impacts on the civilian population and also affect their mental health due to stress. To stop these attacks war was fought between Israel and Hezbollah in 2006. This respected study by Patrick et al is based on the assessment of post-traumatic stress disorder (PTSD) and to assess potential risk and flexibility factors in both the civilian population i.e. of Israeli and Arab populations from July 12 to August 14, 2006. During this period lasting from July 12 to August 14, 2006 approximately 4000 rockets fell in the areas of Northern Israel. According to the Israeli Ministry of Foreign Affairs, 2006 more than 300,000 Israelis evacuated Northern Israel and more than 1,000,000 lived in air-raid shelters. A telephone survey was conducted on the bases of random sampling to assess the mental trauma due to this war. Sampling was done on the basis of random selection from the lists based on the Israeli telephone company (Bezeq) database of landline telephone numbers. The data base contains approximately 98% of the telephone numbers in Israel. The people selected for the telephonic interview was selected on the basis of socioeconomic and geographical variables and comprising of sample adults Israelis. 3788 house hold numbers were called off which about 24.5% were irrelevant. The final useable response rate from useable connections was 52.4 %. Two-tailed Pearson chi-square tests, independent sample t-tests were used to analyze the data. Variables with P-values < 0.1 were included. The results showed that 67.1% of the individuals selected for the interviews experience at least on type of event.

Miller and Rasmussen (2009) examined the conflict between advocates of trauma focused versus psychosocial approach in understanding & addressing the mental health needs of communities affected by armed conflict. These two approaches are fundamentally different regarding the factors that influence the most the mental health in conflict & post conflict settings by emphasizing the role played by the daily stresses (stressful social & material conditions) in mediating the direct war exposure & mental health. The critical factor of trauma focused advocates was the direct exposure to the violence which gave no importance to the contribution of stressful social & material conditions. For psychosocial advocates in contrast focused on the stressful social & material conditions (daily stresses) caused by armed conflict. A model was proposed on the basis of the data drawn by the recent studies in which daily stressors partially mediated the impacts of direct war exposure on the mental health. According to that model an integrative approach to intervention was proposed in which daily stressors were first addressed and for individuals a specialized intervention was proposed whose distresses did not abate with the normalization of their environment through the reduction of daily stressors.

Edward et al (2010) assessed the impacts of intensive bombing on the poverty persistence in Vietnam. Vietnam War experienced one of the most intense bombing and loss of human lives in war history. US forces conducted very intense bombing

in many regions of the Vietnam during this war. Vietnam War experienced three times more intense bombing (by weight) as compare to World War II and fifteen times more (by tonnage) as in Korean War. Destruction due to wars is not hidden and neither are their future outcomes on economy of the countries affected. Main impact of armed conflicts is destruction of physical capital and human capital. Post war assessment models predict that as the economy of the country comes back to its steady flow, there are no long term effects of war. War may also affect the quality of technologies, institutes and social outcomes. It is often said that advancement in military technologies and hardware lead to increase in technological progress and in turn balance the destruction done due to armed conflicts. Economics sector of a country faces the major long term effects of the war. Comparative study was conducted with respected heavily bombed areas and demilitarized areas of the country. Different statistical methods were used to analyze the data. The magnitude of bombing is estimated by considering non bombing zone and average bombing zone of 32.3 bombs, missiles, and rockets per Km<sup>2</sup>. The result after the calculations is 0.008 which is very low. It is concluded that even one the most heavily bombing in the history of human armed conflicts have little impact on poverty rates on the country. This is because most of the bombing took place in the rural areas of South Vietnam were little infrastructure is intact to destroy. Another factor is the fast reconstruction effort of Vietnam Government after the war using the mass mobilization of labor in the reconstruction process.

Felt *et al.*, (2008) worked on the detection and concentration of explosives contamination in soil by using hplc with UV in the United States. The most of the contaminated soil is found in test range and firing range sites of government security organization. The contamination was in the form of RDX, TNT and their derivatives. In USEPA two method are widely used for the determination of explosives one is 8330 and second is 8095 but the most pronounced and accurate method is 8330. The 8330 method is further modified to 8330 B which is similar to 8330 but used for low concentration contamination and acceptable all over the world in which HPLC with UV and column C 18 is used. Standards were prepared with ratio of 2mg/L of explosives and 2ml of each solution with 300 g homogenized soil and extraction of the soil was taken according to USEPA. Two concentration technique were used in first one solid phase extraction cartridge were used and in second one low level salting out method were used. The short comes of traditional method used for the analysis of explosives were considerably decreased by using 8330 B method and also the standard deviation obtained from this method were lower as compared to traditional method used. The problems caused by explosives based contaminants can be detected by using this concentrative extraction procedure for low level contaminations.

### **Research Methodology**

#### **Water Sampling:**

Water samples were collected from six different villages in the Mata district of Swat Pakistan. Villages named as Kurray, Behi, Shawar, Deth pani, Shokh dara, Aghal were selected on the basis of access in the area due to security situation of the Mata district which was a former strong hold of the Tehrik-e-Taliban Pakistan. Three different streams/water channels were selected for water sampling near the impact zone of the bombing experienced by the selected villages. Water samples were collected at three different points downstream from each selected stream/water channel. Two samples were collected

from same point with the time difference of 30 minutes. Total of six water samples were collected from a stream two from each point and distance between the three points was 400 meters. Same sampling technique was used for the other two stream/water channels. Ten ground water samples were selected from the homes near the impact zones in the selected villages. Two field visits were conducted for the water sampling using the same sampling technique in months of Feb and May 2011.

Water samples were collected in the sampling bottles properly labeled and rinsed before the sampling. Cap of sampling bottle was removed carefully evading contamination by hands or dust particulates in the air by gripping on outside surface with inside surface facing down. Samples were collected from flowing water as recommended by US EPA and sampling bottle was carefully placed in current facing upstream and filled. Samples were immediately sealed and stores in the ice at 4°C<sup>1</sup>.

#### Conductivity

Conductivity of ground and surface water samples was measured by using OAKION conductivity meter 10 series by EUTECH in the laboratory by using standard procedure and method.

#### PH

PH of the ground and surface samples were determined by the JENWAY 3505 pH meter in the laboratory by using standard procedure and method.

#### COD

Chemical oxygen demand (COD) was determined in the laboratory. First digester solution was prepared by drying 1.02 g potassium dichromate at 150 C for two hours. Then dry potassium dichromate was added with 33.3 g HgSO<sub>4</sub> and some distilled water in a volumetric flask. Then 167 ml sulphuric acid was added in the same volumetric flask and make solution up to 1000 ml with distilled water. The average life time of digester solution is 3 to 4 months. Then sulphuric acid reagent was prepared by adding 1.1 g AgSO<sub>4</sub> and 1 kg H<sub>2</sub>SO<sub>4</sub> in volumetric flask. Finally COD vials were prepared by adding 1.5ml digestion solution, and then 3.5 ml H<sub>2</sub>SO<sub>4</sub> reagent was added. In the end 2.5 ml of water sample was added along the wall of the vial. Prepared COD vials were put in digester for 2 hours and COD values were measured in spectrophotometer at 420 nm.

#### TNT determination

TNT was determined by using HPLC device. 20 ml of sample was filtered from PTFE 0.45µm filter. The mobile phase was water and methanol at 50:50 and flow rate was 1 ml/min for 20 minutes injection volume of sample was 10µl and detection was on 254nm with UV detector. The Perkin Elmer HPLC (with pump) series 200, C18 column; 25cm×4.6cm, 5µm with UV detector was used for the detection of TNT. The results obtained were compared with the results of standard.

#### Water Analysis

Three different streams were selected in the impacted area of Mata Tehsil near the affected villages. Ground water samples were also collected from the different wells, houses and water pumps near the impacted area of bombing during military operation. Different experiments have been conducted on the surface and ground water samples from the impacted area in order to assess the impacts of conflict in the Mata Tehsil of Swat District. The test results clearly show that there are no adverse impacts of the conflict in the water quality of the area.

The pH graph of first sampling visit clearly indicates that the pH of all the surface water samples of Mata Tehsil is in range of 7.28-7.73 (figure 1) which is under permissible limits<sup>2</sup>. This result clearly matches the pH of Malakand Division determined by F.K Bangash in 2003<sup>3</sup>. There is no evidence of any contamination due to the military operation or bombing. There is a slight increase in the pH of surface water samples in the second sampling visit because of the reason that the first sampling was done during the wet season and the second sampling was done in dry season.

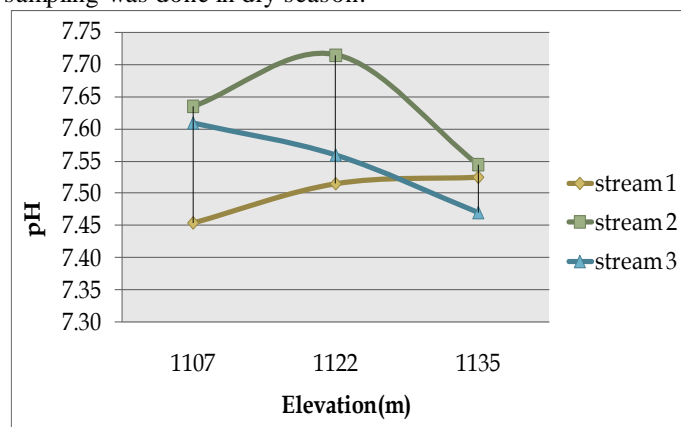


Figure 1: Surface water pH of streams in wet season

So this might be the reason of the slight increase in pH but all the results of second sampling clearly indicate that all the pH values are in range of 7.43-7.7 (figure 2) which is under permissible limit<sup>4</sup>.

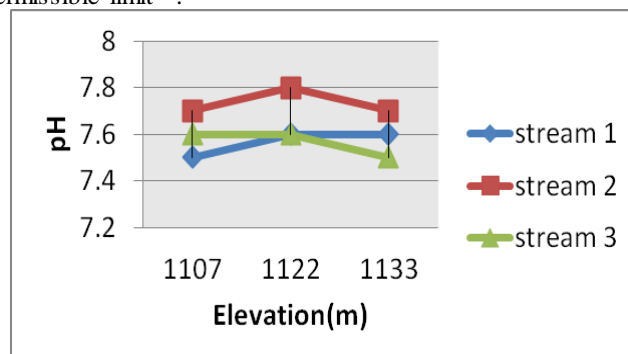


Figure 2: Surface water pH of streams in dry season

pH results of ground water sampling also does not indicate any contamination in the drinking water use by the local residents from any of the well and water pumps in the impacted area. All the pH results are in range of 6.9-7.57 and 7.06-7.54 in the both sampling.

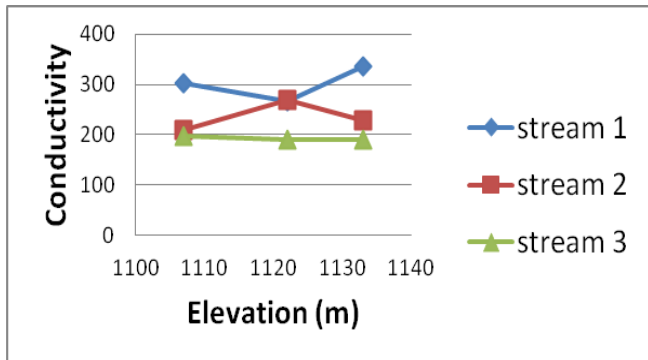
Conductivity of the surface water samples from all the collection points of three streams ranges from 190 to 337 µS/m at different elevations. Which clearly indicates no adverse activity in the water and quality of all the three streams was under permissible limits (figure 3).

<sup>2</sup> (NSDWQ, 2008)

<sup>3</sup> (Bangash et al, 2003)

<sup>4</sup> (NSDWQ, 2008).

<sup>1</sup> (US EPA) Environmental protection agency. Of United States.

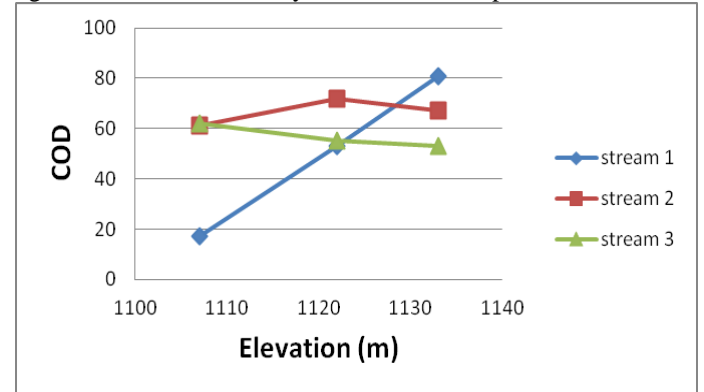


**Figure 3: Surface water conductivity of streams in Wet season**

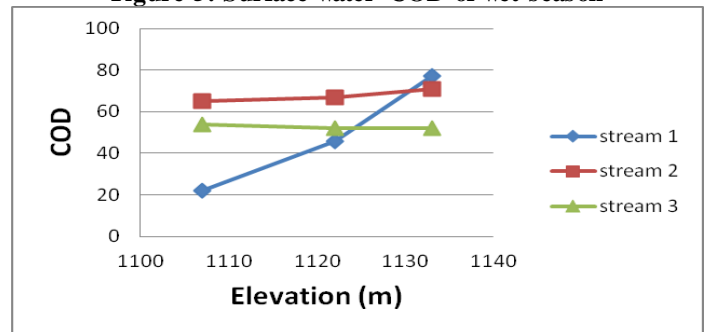
The results from the second sampling also indicate no adverse impacts of the conflict on the surface water quality in the impacted zone. All the results show slightly decrease in conductivity of surface water samples in the second sampling visit. All the results lie between 179-311 µS/m which clearly indicate no adverse impacts of the military operation or bombing on the surface water quality. The first sampling campaign conducted in the wet season has slightly higher EC value then the second sampling campaign done in the dry season. Electrical conductivity depends on the total dissolve solids (TDS) in the water that's why sea water has higher EC and distal water has the least EC values. The higher values of EC in the wet season are due to the increase of TDS due to run off into the streams and other factors that increase the TDS in the wet season.

Ground water results ranges from 410 mg/L to 587 µS/m and for second sampling visit it ranges between 388 mg/L to 759 µS/m.

COD values of surface water samples varying from 17 to 81 mg/L which are also clearly under the WHO permissible limits<sup>5</sup>.



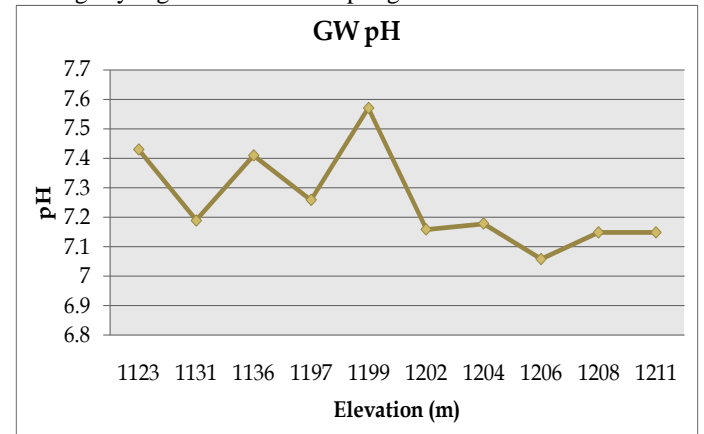
**Figure 5: Surface water COD of wet season**



**Figure 6: Surface water COD of dry season**

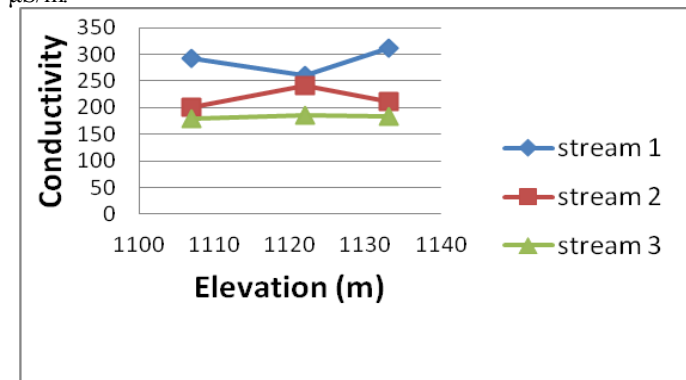
Ground water samples collected from the nearby houses of the impact zones indicate no adverse impact of the bombing on the ground water pH. All the results clearly shows no traces of any contamination or change in the chemistry of the ground water and all the pH values are well with permissible limit<sup>6</sup>.

pH values of all the samples collected from the houses near impact zones show uneven pattern with decrease in elevation. But ground water results clearly shows a seasonal change in the second sampling done in the dry season and all the pH values are slightly higher then the sampling done in the wet season.



**Figure 7: Ground water pH of wet season**

COD values of ground water samples were also well within permissible limits of the WHO and vary from 9 to 53 mg/L. COD values of all the ground water samples decreases with decrease in elevation except at 1199 meters were the COD value was highest amongst all the samples.



**Figure 4: Surface water conductivity of stream in dry season**

The observed COD values in all the 3 streams are varying from 17 to 81 mg/L. The permissible limit of COD for drinking water is 255 mg/L. In stream-1 shows an inclined trends in the COD with increase in elevation from 1107 to 1133 meters. The COD of stream-1 varies from 17 mg/L to maximum of 81 mg/L at 1133 meters. Stream-2 COD values varies from 61 mg/L at 1107 meters then the COD value again rises at 1122 meters i.e. 72 mg/L and the value again decreases to 67 mg/L at 1133 meters. At elevation of 1107 meters the COD value of stream-3 is 62 mg/L and it gradually decreases with elevation to a value of 53 mg/L at 1133 meters.

The COD values of second sampling campaign in dry season vary from 22 mg/L at 1107 meters to 77 mg/L at 1133 meters. Hence the observed COD values in all the 3 streams are well within the desirable limit in both sampling visits (WHO).

<sup>5</sup> (Shyamala et al, 2008)

<sup>6</sup> (Shyamala et al, 2008)

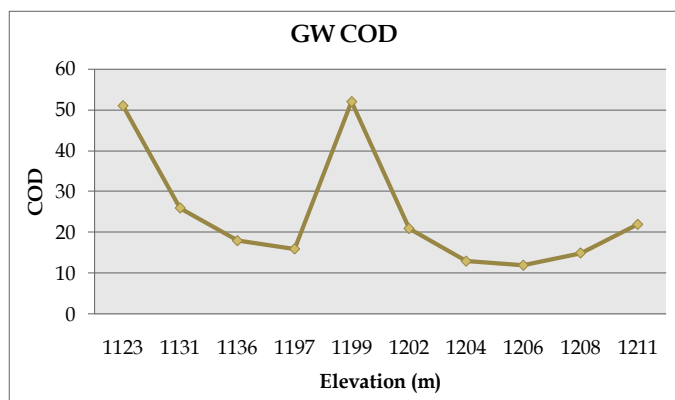


Figure 8: Ground water COD of wet season

#### TNT determination

Trinitrotoluene (TNT) is the most commonly used explosive since World War 1. Exposure to TNT has been reported to result in serious noxious effects, such as liver injury and noticeable changes in the haemopoietic system producing anemia<sup>7</sup>. All the surface and ground water samples collected from the impacted area under study were analyzed using US EPA 8330B method on high performance liquid chromatography. All of the test results indicate no evidence of TNT presence in the surface or ground water samples. The reason might be that all the explosives shells used in the bombing gives a high level detonation and leaves too little residues to contaminate the ground water<sup>8</sup>. The expected half-life of 2,4,6-trinitrotoluene in surface waters is 0.16-1.28 hours, based on the rate of photolysis and photo oxidation in sunlit natural waters<sup>9</sup>. Possibilities of surface water contamination due to the TNT are very low because of the fact that the selected streams are at some distance from the impacted zone. TNT does not undergo hydrolysis, as demonstrated by the stability of the compound in sea water after 108 days at room temperature<sup>10</sup>. So the possibility of hydrolysis in water is not possible in case to TNT. If somehow surface water became contaminated with TNT it would have washed out from the area because the current study is conducted after nearly two years of military operation in Mata Tehsil. Photolysis of 2,4,6-trinitrotoluene in aqueous solutions is a well-known phenomenon, which is responsible for the development of pink water and is probably the most important fate process for 2,4,6-trinitrotoluene in aqueous systems<sup>11</sup>. This may also be the reason for no detection of TNT in the surface water.

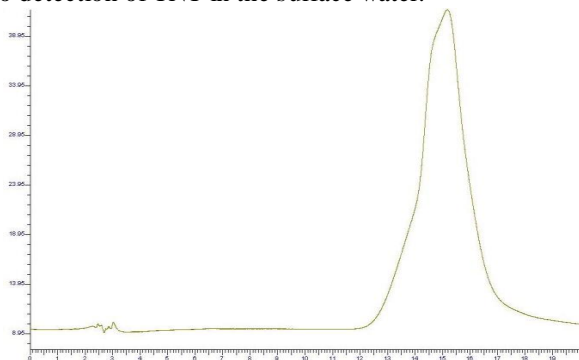


Figure 9: TNT standard peak by HPLC

#### Soil Sampling

Soil samples were collected from six different villages in the Mata district of Swat Pakistan. Villages named as Kurray, Behi, Shawar, Deth pani, Shokh dara, Aghal were selected on the basis of access in the area due to security situation of the Mata district which was a former strong hold of the Tehrik-e-Taliban Pakistan. Six different impact points of bombing were selected which were still undisturbed by the local residence. A reference zone was selected which did not experience any bombing during or after the conflict as identified by the local residents of the area. Composite soil samples were collected one from surface and one from sub-surface of 1.5 meter depth<sup>12</sup>. This sampling technique was used for soil sampling at three more points having a gap of 5 meters downstream from impact zone. Total of 72 soil samples were collected in each of two field visits using the same sampling technique in months of Feb and May 2011.

Soil samples were collected in the plastic bags which were properly labeled and sealed after the sampling. Samples were kept in ice at 4 C and transferred to laboratory for analysis.

#### Soil analyses:

Mata Tehsil remain a hub of the Taliban movement in the Swat District for many years until the military has conducted a decisive operation in this region to flash out Taliban from the strong hold of Mata. Heavy bombing was used against the militants in the area and the basic explosives used in the artillery shells were 2-3.5 kg TNT<sup>13</sup>.

Soil samples were collected in two sampling visits from six point zones of the bombing and two reference zones which experienced no bombing during the military operation. The observed pH values from all the point zones (surface/sub surface) indicates normal H<sup>+</sup> ion values of normal agricultural lands between 7-8<sup>14</sup>. pH of soil samples collected in the dry season was slightly lower in pH then the samples from the second sampling visit which was conducted in dry season. The reason might be that the precipitation in the wet season causes increased in leaching of base cations and soil pH become slightly lower than during the dry season<sup>15</sup>.

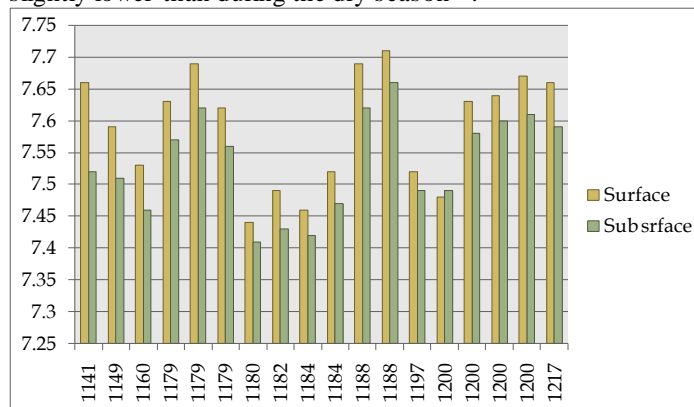


Figure 10: Soil pH of surface and sub-surface samples

There is no clear indication of difference between the pH of point and reference zones soil samples from the impacted area of 2009 military operation. One important point regarding the bombing and its impacts on soil is that the pH of the soils exerted no effect on 2,4,6-trinitrotoluene adsorption, desorption

<sup>7</sup> (Ying Liu et al, 1995)

<sup>8</sup> (Jenkins et al., 2000)

<sup>9</sup> (Howard et al. 1991)

<sup>10</sup> (Hoffsommer and Rosen 1973)

<sup>11</sup> (US.PHS, p.101)

<sup>12</sup> (Halasz et al., 2002) *Chomatograph*. 963. 411-418.

<sup>13</sup> (www.POF.com.pk)

<sup>14</sup> (McCauley et al, 2009)

<sup>15</sup> (McCauley et al, 2009)



or transformation<sup>16</sup>. increase in death and distance from the target area the concentration of TNT decreases rapidly<sup>17</sup>. Solid chunks of 2,4,6-trinitrotoluene buried in soil or exposed on the soil surface can persist for many years<sup>18</sup>. In smaller amounts 2,4,6-trinitrotoluene may undergo photolysis in surface soils<sup>19</sup>.

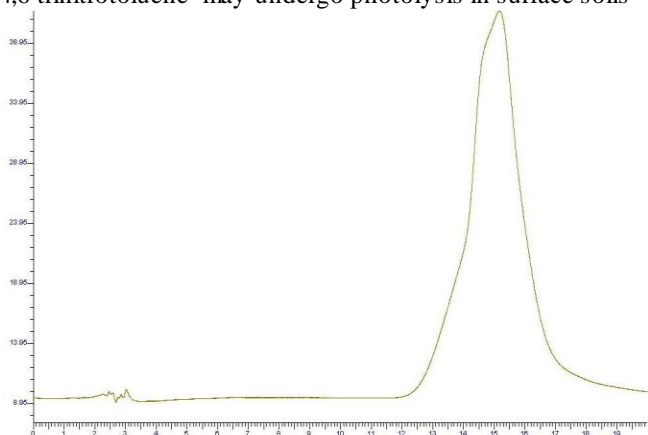


Figure 11: TNT standard peak by HPLC

One of the most strong reasons for the removal of TNT from water and soil is the 2010 July 2010, resulting from heavy monsoon rains in the Khyber Pakhtunkhwa, Sind, Punjab and Baluchistan regions of Pakistan and affected the Indus River basin<sup>20</sup>. These were the worst ever monsoon rains in these areas in last 80 years. Heavy rain falls of more than 200 millimeters (7.9 in) were recorded during the four day wet spell from 27 July to 30 July, 2010 in the provinces of Khyber Pakhtunkhwa and Punjab based on data from the Pakistan Meteorological Department. About 338 mm of rains were recorded in Saidu-sharif area of Swat.

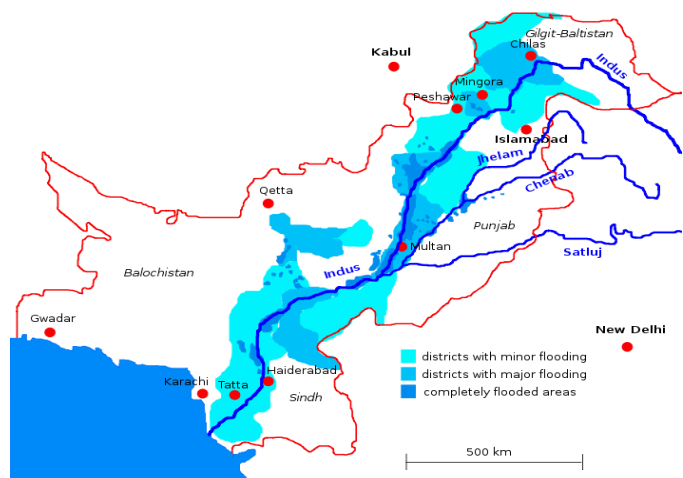


Figure 12: Flood affected area of Pakistan in 2010 flood.

Soil texture of Mata Tehsil as compare to Lower Dir area of Malakand Agency is mostly composed of 60-70% of sand and rest is clay and silt on the upper layers<sup>21</sup>. The sandy soil texture and heavy precipitation in the area has most probably washed out all the negative impacts of military operation in the area including the trace amounts of TNT.

**Questioner Sampling**

Total of 270 questioners were filled on the basis of 94% confidence level and 6 % error from the six selected villages named as namely Kurray, Behi, Shawar, Deth pani, Shokh dara, Aghal. The total adult population of the area was 114495 according to the district census report 1998. Unstructured random sampling was used for the questioner survey in the impacted area. Respondents of age 18 years and older were selected randomly<sup>22</sup>.

S.No	Villages	No. Of Respondents
1	Shawar	30
2	Behi	35
3	Deth pani	65
4	Shokh dara	32
5	Kurray	70
6	Aghal	38
	Total	270

**Demographic data of affected villages**

**Age**

Age play important role in the formation of attitude of individual in social set up. It is an important variable that affect the thinking and attitude pattern of individual toward development. First of all, the age profile of the respondents was studied by gathering information about the age of the respondents in residential areas in impacted localities of Mata Tehsil. Over all 270 Questioners were filled on basis of random sampling in all the six selected villages. All the randomly selected respondents are male due to the fact that the area under study has strong cultural values and Islamic traditions hence women are not allowed to communicate with strangers.

**Age level of affected villages in Mata Swat**

Although the inter-location difference on household age was statistically significant, implying that the age of the respondents of selected villages in Mata Tehsil is not similar. About 29.6% of all the respondents are in the age group of 18-28 years, 37.8% of respondents are of age group from 29-39 years, 22.6 % belongs to age group of 40-50 years and only a small percent of respondents in all the selected villages are above 50 years of age (table 1). Its is clear from the table 1 that most of the respondents belong to age group of 29-39 years i.e 37.8%. This implies that the respondents belong to average level of physical and mental active groups (figure 13).

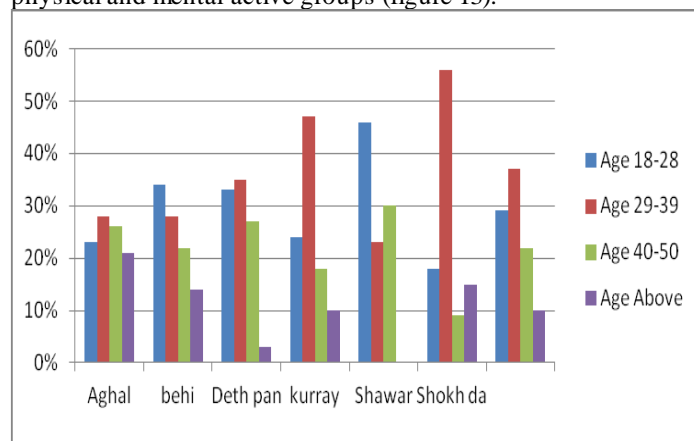


Figure 13: Age groups in affected villages

<sup>16</sup> (US.PHS, p.99)

<sup>17</sup> (Clausen et al, 2004)

<sup>18</sup> (Rosenblatt, 1980)

<sup>19</sup> (Ryon et al, 1984)

<sup>20</sup> (BBC News 2010)

<sup>21</sup> (nafees et al, 2008b)

<sup>22</sup> (Patrick et al, 2006)

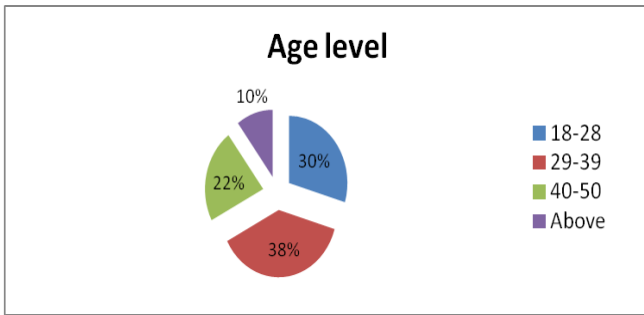


Figure 14: Overall % age of age levels

**Education level**

The inter-location difference on respondent's education level was statistically significant, implying that the age of the respondents of selected villages in Mata Tehsil is not similar (figure 15) About 44% of the total respondents are illiterate because the area selected is a rural area of Swat District mostly dependent on the agriculture<sup>23</sup>. High education respondent was found in Kurray and Deth pan. On the other hand poor situation respondent education was found in Aghal and Behi where no respondent was found above matriculation Most of the respondents among the literate belongs to matriculation level of education and least belongs to the master level i.e. of 2.6% (figure 3). This chart clearly shows the poor education level of all the selected villages most evidently because of the backwards of the area and lack of educational institute in this conflicted area. Village Kurray has most of the literate respondents and village Shawar has most of the illiterate respondents among the affected villages in Mata Tehsil (figure 3).

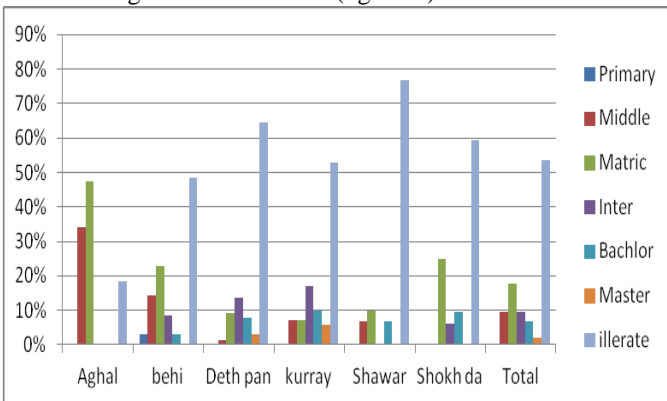


Figure 15: Level of education on village level

46% of all the respondents in the selected villages were literate and 54% of all the respondents were illiterate showing the poor quality of education level and lack of tend towards the education in the local residents (figure 16).

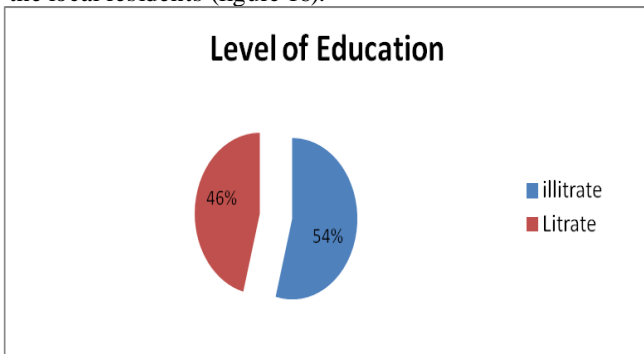


Figure 16: Overall % age of literate & illiterate respondents

**House Hold size**

The house hold size of all the selected villages is statistically significant showing no similarity among the house hold size. About 46.2% of house holds size ranges from 4-10, 30.3% were having 2-5 family members and 23.5 % of house holds size of respondents in all the villages was above 10 family members (Figure 17).

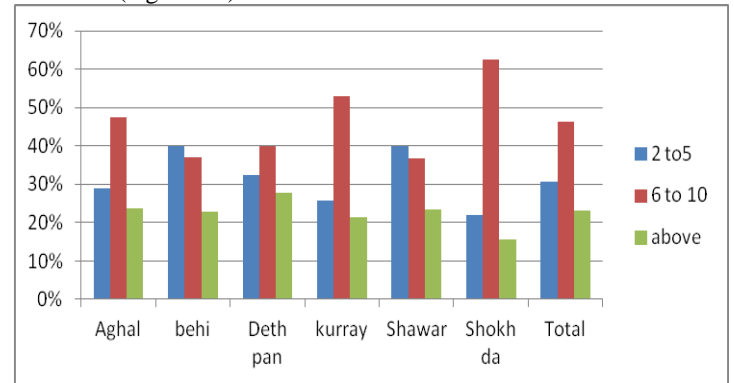


Figure 17: House hold size distribution on village level  
**Social Impacts of military operation Agricultural land affected**

The difference between the agricultural lands affected due to the military operation was statistically significant, implying that the land affected of the respondents of selected villages in Mata Tehsil is not similar. About 99 % of the residents in the Swat belong to agriculture directly or indirectly. With the exception of a few, all the landowners have small tracks of land. These holdings are so small that the holders are not only landlords but they are peasants too<sup>24</sup>.

The significance level of the land affected due to military operation is because of the fact that some respondents do not have any agric land and belongs to other professions and some respondents do have agric lands but the military did not allow them to go to their fields.

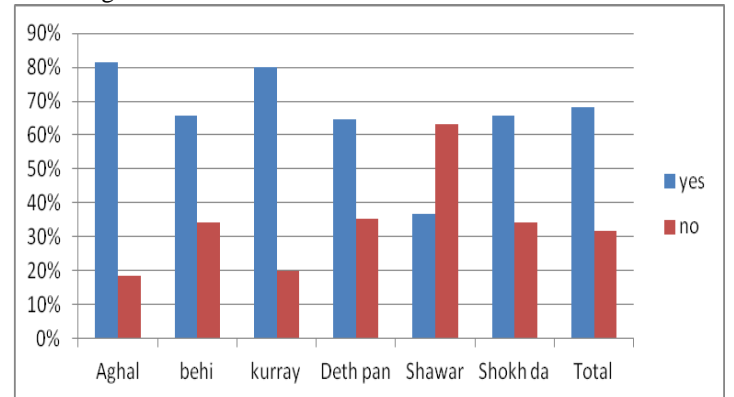


Figure 18: Land affected due to military operation on village level

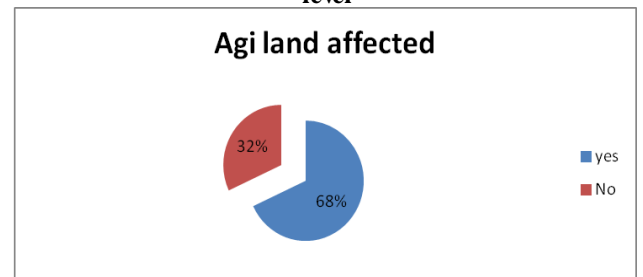


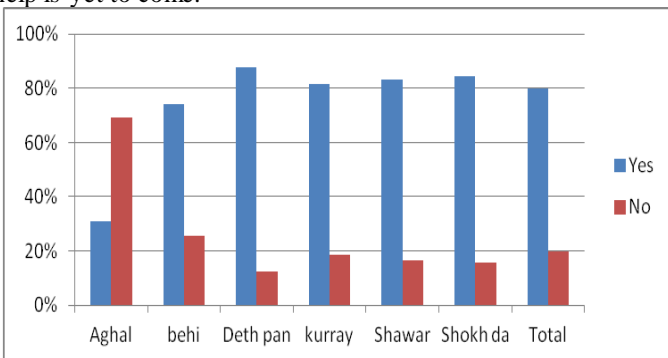
Figure 19: Overall % age of land affected

<sup>23</sup> (IPRI fact file, 2009)

<sup>24</sup> (IPRI fact file, 2009)

**Economic effects due to military operation**

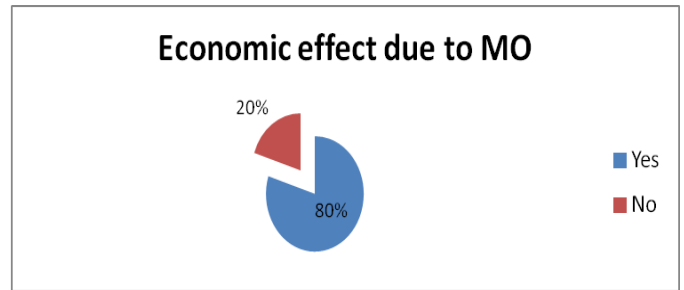
Edward Miguel studies the long term impacts of bombing in Vietnam and concluded that there are no long term effects of intense bombing in Vietnam<sup>25</sup>. But it was clearly evident from the current study that in short terms there are adverse effects of war on the local poverty level and economic situation of the local residents. The difference between the residents of local area affected due to the military operation was statistically significant, implying that the local population affected due to military operation of selected villages in Mata Tehsil is not similar. The reason might be that because some respondents work in the foreign and some are government servants so the military operation does not affect these respondents. Otherwise 80% of the local population has reportedly experienced adverse economic losses due to damage to infrastructure, due to lack of access to their agricultural lands, army settlement, and threat from Taliban and Curfews (figure 20). Vietnam did not experience any long term effects of the world’s most intense bombing because most the bombing was experienced by the rural areas of the country where there was very little infrastructure for damage<sup>26</sup>. But the fact is that if the overall growth rate of the country is growing and basic infrastructure is rebuilt, this does not mean that the local population directly affected by the war did not experience long term economic problems. 80% of the respondents in the affected villages have reported serious economic effects due to the military operation. Still after two years of ending conflict in Mata (Swat) local residents face serious economical problems and government help is yet to come.



**Figure 20: Economic affects due to M.O on village level**

Another important factor counteracting the effects of U.S. bombing was the major Vietnamese government reconstruction effort after the war, with massive mobilization of labor and resources to rebuild damaged infrastructure and demine the country side<sup>27</sup>. However in Mata government has yet to play its role and there are strong possibilities that there will be many long term economic effects of the conflict and poverty traps.

<sup>25</sup> (Miguel et al, 2010) (university of California. national bureau of economic research)  
<sup>26</sup> (Miguel et al, 2010) (university of California. national bureau of economic research)  
<sup>27</sup> (Miguel et al, 2010) (university of California. national bureau of economic research)

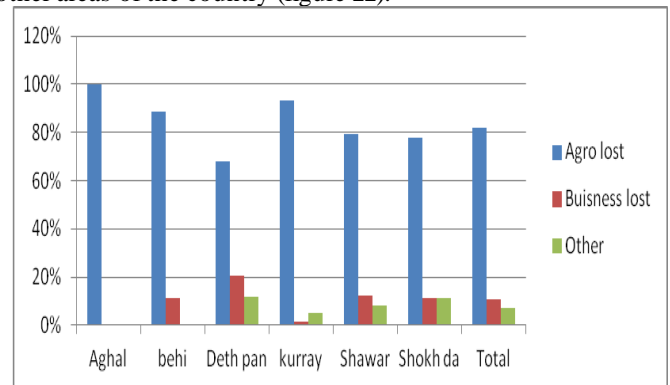


**Figure 21: Overall % age of economic effects due to MO**

**Types of economic effects due to military operation**

According to IPRI fact files 2009 more than 90 % of local residents are associated with the agriculture sector either directly or indirectly<sup>28</sup>. The .033 significance level shows that the local residents belongs to different profession and have faced different type’s economic effects. Many people in the area face agricultural losses, loss in business due to lack of access to the markets, local labors also face unemployment but later they got a lot work when the reconstruction process starts.

About 82% of the respondents have reported to face agricultural loss due to the fact that they have little or no access to their fields so they are unable to raise considerable amount of crops to sell them in the market. Some of them also have little access to the market due to the uncertain security situation and curfews so are unable to sell their goods. Most of the people are not even present in the area because they have migrated to the other areas of the country (figure 22).

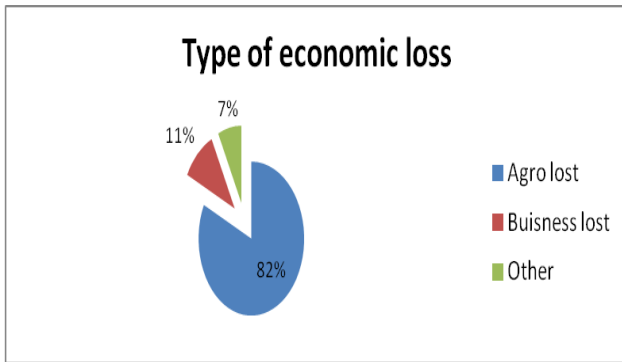


**Figure 22: Types of economic effects due to military operation on village level**

Swat is famous for its fresh fruits like apple, peach, Japanese fruit and pear. In Swat Valley, till 1990, apple was grown on 44.4% area mostly covering middle and upper Swat<sup>29</sup>. In the late 90s, the trend shifted toward peaches. While in lower Swat persimmon is a common fruit crop<sup>30</sup>. Many of the local residents are related to fruit business (packing, storing, transport to other areas of the country and even its export) also experienced business lost. Local labor related to this fruit business and agriculture is among the all that face the economic impacts of the military operation in the area.

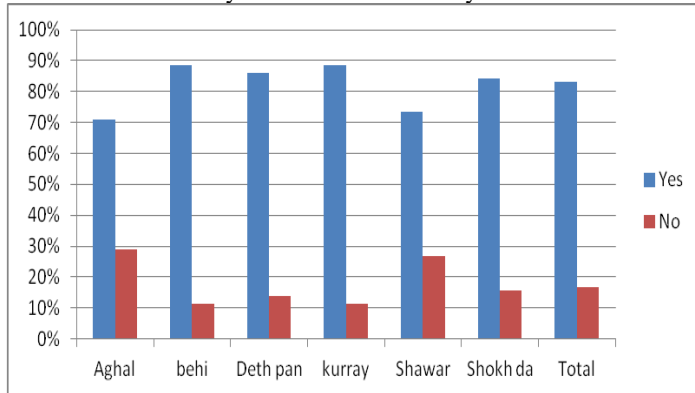
<sup>28</sup> (IPRI fact file, 2009)  
<sup>29</sup> (Inam, 2000) ( Addressing Environmental Consequences of War. Background )  
<sup>30</sup> (Nafees, 2008)( Addressing Environmental Consequences of War. Background )



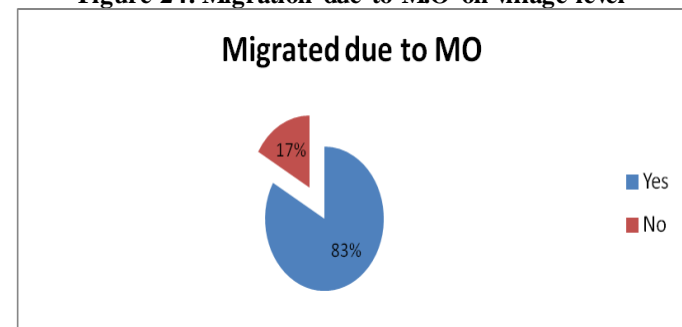


**Figure 23: Overall % age showing types of economic losses Migration due to military operation**

Due to this operation mass displacement of people occurred in May 2009. Estimated population displaced from Swat valley is 1.3 million. After the completion of operation displaced people returned to their homes on 13 July 2009<sup>31</sup>. The non significance level of 0.119 clearly shows that their vast similarity between all the respondents of the selected villages. About 83.3% of the local residents migrated due to this military operation. 16.7% of the respondent gives a negative answer regarding the migration during the military operation. This might be because they settle down for taking care of their properties in the area or feel safe from the military operation and its impacts (figure 24). It is clearly evident from table 4-6 that their is a strong relationship between the economic effect due to the military operation and migration of the local residents. All the respondents that have migrated due to the military operation face serious economic impacts due to lack accessibility to their lands, shops and works and also because of the damage done to their infrastructure by the Taliban or military.



**Figure 24: Migration due to MO on village level**

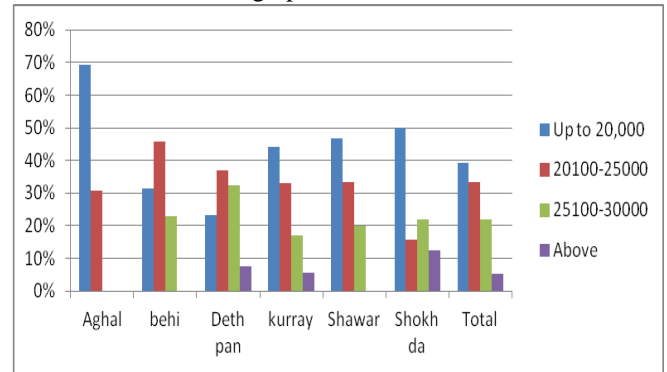


**Figure 25: Overall % age of migration due to MO**

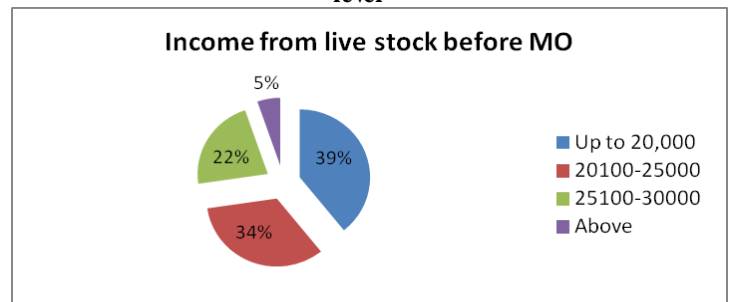
**Income from Live stock before and after MO**

Cross tabs of difference in income before and after military operation clearly shows the statistical significance level. About

39% of the respondents in the villages had a live stock income of 234 US \$/year before military operation. This percentage then decreased by 30% after military operation due to the damage done to their live stock during operation. Most of the respondents left their livestock behind during migration from the area and never got them back after their return. 33.5% of respondents had a livestock income of 235 US \$ to 293 US \$. This percentage increased to 37.8 % due to increase in the prices and also due to less competition from other competitors who had lost their livestock during operation.

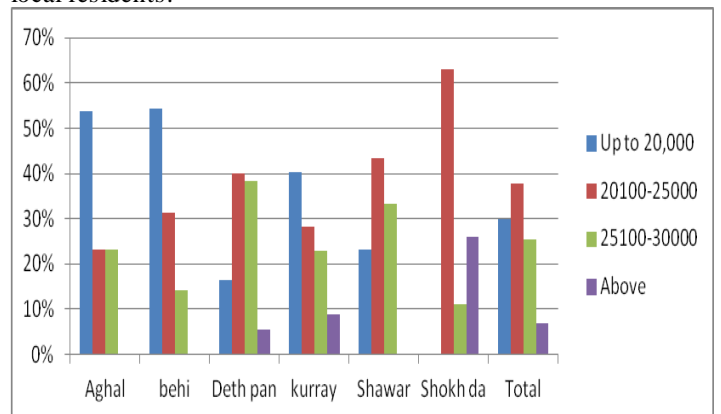


**Figure 26: Income from Live stock Before M.O on village level**



**Figure 27: Overall % age of income from live stock Before MO**

22% of respondents had an income of 236 \$ to 350\$ and this percentage increased to almost 26% after the military operation. 5.3% of local residents reported income of more then 350\$ and this percentage also increased to 6.9% after military operation. It might be evident that income has been increased after military operation but with this increase the prices have also gone above at the end giving no economic benefits to the local residents.



**Figure 28: Income from Live stock after M.O on village level**

<sup>31</sup> (Fazal. publication 2009)

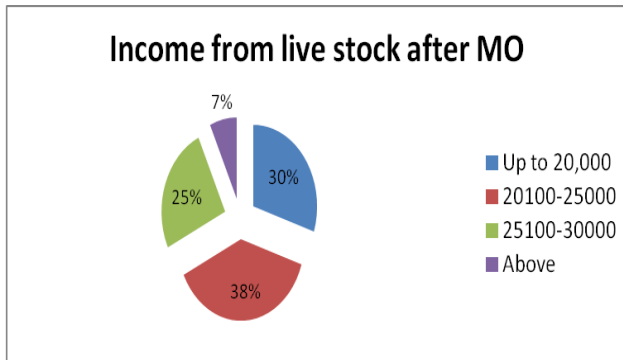


Figure 29: Overall % age of income from live stock After MO

**Damage done to infrastructure due to military operation**

There is a high statistically non significance response regarding the damages done to major roads and bridge in the area. 100% of respondents have reported a positive response to the question regarding the damages done to roads and bridges. About 65% have reported damages to their houses and shops. 47.8% of respondents have reported heavily damage to the electrical supply in the area, 25.9% have reported completely destruction of electric supplies and remaining 26% have reported partially damage done to electric supply systems in their area. Most of the bridges were destroyed by Taliban in order to stop the movement of army during military operation and most of the roads were destroyed due to road side bombs, movement of heavy armored vehicles like tanks and due to intense fighting in the area.

**Health impacts due to military operation**

There were no reports of any disease outbreak during or after the military operation in any of the six villages. There was no evidence of any increase or decrease in the diseases during or after military operation only a few respondents have reported the increase in miner diseases like flu. About 61.3% of respondents have face health problems during the migration period that might be because of hot climatic changes of lower areas of country. 9% of respondents have reported behavioral changes in the children and 12% in the adults. 64% people are affected by Taliban of which 24.7% were injured, 2% were killed, 4% were kidnapped and 71% were harassed by Taliban. Only 2% people physically affected by the military operation due to the fact that almost every person was migrated before the operation had started.

**Environmental impacts of military operation**

**Wild life affected by military operation**

In military operation 93% of all the respondents reported to have seen change in the wild life of the local area as evident from (figure 30). 7% people did not observe any change in the local wild life of the area. Many wild animals of the area are wiped out due to intense fighting and bombing in the area. Many bird species once seen often by the local residents have not been observed after military operation. The reason might be that the birds have migrated to other areas due to destruction of their local habitat due to fire and intense sound of gun fire and artillery shells.

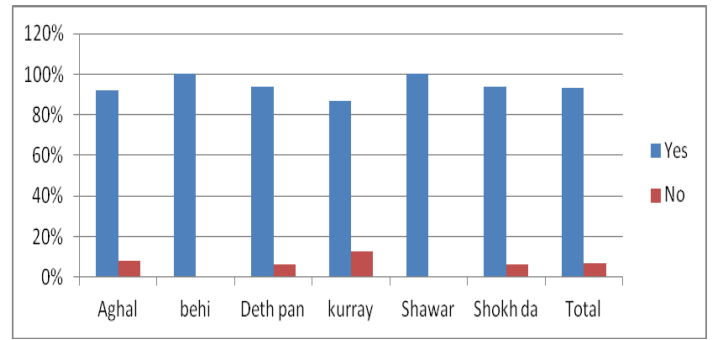


Figure 30: Wild life affected due to military operation

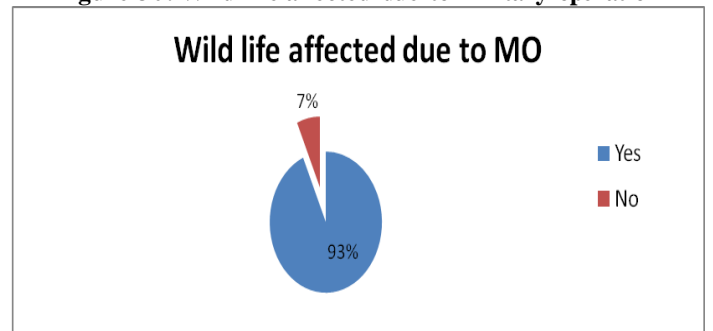


Figure 31: Overall % age of wild life affected

**Natural resources affected due to military operation**

Forests are the most affected natural resource during the military operation due to the fact that these are used by the militants as a hide out. Forests can provide refuge, funds, and food for combatants in civil war. Insurgents may also use forested regions to hide from government troops and the government may choose to ignore them if they remain in remote forested regions<sup>32</sup>. That's why during military operation these were mostly bombed by the army to wipe out the militants hide out. All the respondents in Matta Tehsil have reported the damage done to forests in their areas and 2.5% have observed damage done to pasture lands.

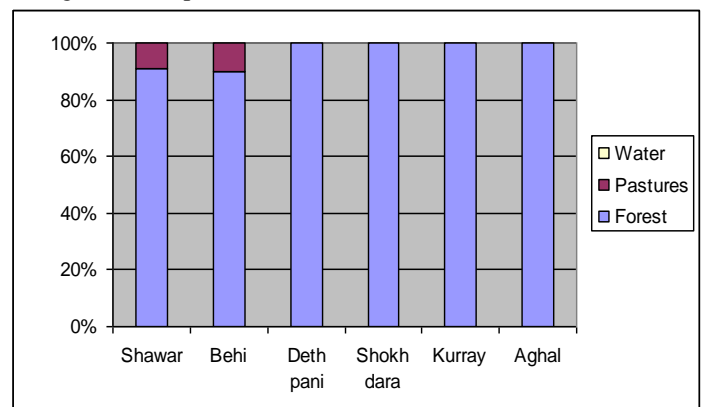
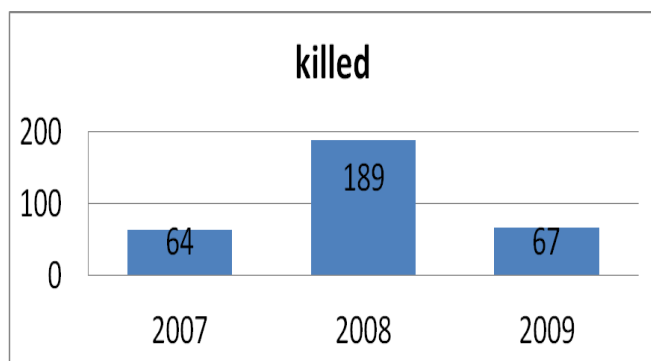


Figure 32: Distribution of respondents in villages

**Additional Data**

Additional data of injuries and death rates due to the military operation is collected from the Casualty Unit of Saidu Sharif Hospital Mingora city district Swat. Damage reports related to educational institutes in the area was collected from the EDO office Mingora city district Swat. Data of past three years was collected for year 2007-2009 which experienced the main battle in the Swat District.

<sup>32</sup> (Rustad et al, 2008)

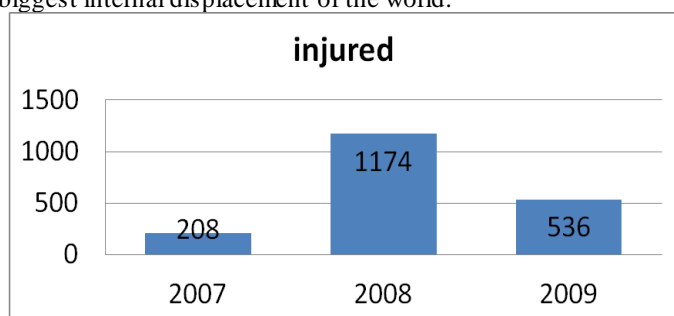


**Figure 33: No. of civilian killed during three years**

Figure (23) shows the number of civilian casualties reported from year 2007-2009 in the Saidu Sharif Hospital. Only 64 persons were reportedly killed in year 2007, least number of casualties due to war in all the three years. Death rate was higher in year 2008 and 189 persons were reported dead in the hospital. The death toll again decreased in year 2009 i.e. 67 persons reported dead in the Saidu Sharif hospital.

Secondary data for number of reported injured persons in past three years from 2007-2009 was collected from the casualty unit of S.T.H Saidu Sharif Swat District. Figure (24) shows 208 persons was reported for injuries in year 2007, least number of injured people due to war in all the three years. Year 2008 was most adverse and 1174 persons were injured due to war, higher number of injured person in three years i.e. 2007-2009. In year 2009 the rate of injured persons due to war again become less and only 536 persons were reported injured second lowest in three years.

Both figure (22) and (23) indicate that the year 2007 was less deadly then all the three years from 2007 to 2009. Year 2008 host the main period of conflict between Taliban and Armed forces of Pakistan as evident from the figure (22) and (23) that it is the most deadliest year in terms of killed civilian and injured one's. The death rate in 2009 again became low due to the end of conflict and the militants were wiped out from the area. Only 189 civilian were killed in the most deadly year of 2008 because of the reason that almost all of the local residents had migrated from the area and Pakistan experienced one of the biggest internal displacement of the world.



**Figure 23: No of civilian injured during three years**

#### Conclusion:

Mata Tehsil of Swat District remains hub of Tehrek e Taliban Pakistan for many years and hence faces a major offensive operation from the security forces of Pakistan to clear the area from the militants. Due to this operation intense fight is been conducted in the area between the security forces and the militants to take control of the area. As a result of which major destruction occurred in the area and local population also suffered a lot. Current study is conducted in order to assess the damage done to the social lives of the local population and damage done to local environment. For this purpose number of

field visits were conducted in the area and two sampling campaigns were done in wet and dry seasons. Surface and Ground water samples were collected in dry and wet seasons from the affected villages in order to determine the damage done to water quality due to the conflict. Soil samples were collected from six different villages in the Mata district of Swat Pakistan. Villages named as Kurray, Behi, Shawar, Deth pani, Shokh dara, Aghal were selected on the basis of access in the area due to security situation of the Mata district which was a former strong hold of the Tehrik-e-Taliban Pakistan. Six different impact points of bombing were selected which were still undisturbed by the local residence. Total of 270 questioners were also filled on the basis of 94% confidence level and 6 % error from the six selected villages named as namely Kurray, Behi, Shawar, Deth pani, Shokh dara, Aghal.

The negative impacts of military operation on the social lives of local residents were very much evident from the current study. Local residents of Mata Tehsil of Swat District face serious socioeconomic problems after the military operation. Migration is one big phenomenon that on one side save many lives but on other side creates many problems during their migration period in face of health, shelter, food/water shortage and other problems. These problems seem to continue after their return to native land because of damaged infrastructure, water and food shortage and serious economic problems. Situation is Mata was much more safer than it was during Taliban period but local residents still want army to leave their area very much due to their behavior and hostile environment of the area. There were no reports of any outbreak of diseases during or after the military operation but still children and elders face some behavioral changes like harassment. Environment has also paid its price in term of burned forest and decrease in local wild life but overall the water and soil quality is not been disturbed and no traces of TNT were found in the soil and water. This study was conducted nearly after two years of seize fire in the area and it seems that nature has itself clean the environment or may be the impacts of 2010 flood in Swat covers the adverse impacts of conflict in Mata (Swat).

- No adverse impacts were observed in surface and ground water samples from the impacted area as given in test reports..
- No adverse impacts were observed in surface and sub-surface soil samples from the infected area. As result of test survey.
- Trinitrotoluene (TNT) was not detected in any of water and soil samples from the point zones. As tested the samples, report is attached.
- Adverse social and environmental impacts were observed from the questioner survey.
- Local residents are not comfortable with the army settlement in the area and require an immediate evacuation of the army from the local area.

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