CLIMATIC TRENDS WITH REFERENCE TO SMALL IRRIGATION MANAGEMENT IN NEPAL

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## LOCATIONS

<table>
<thead>
<tr>
<th>River, Location</th>
<th>Basin Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banganga, Taulihawa</td>
<td>187</td>
</tr>
<tr>
<td>Girwari, Nawalparasi</td>
<td>52</td>
</tr>
<tr>
<td>Likhu, Nuwakot</td>
<td>146</td>
</tr>
<tr>
<td>Kamala/Gadauli, Sindhuli</td>
<td>570/25</td>
</tr>
<tr>
<td>Biring/Kali, Jhapa</td>
<td>61/26</td>
</tr>
</tbody>
</table>

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**Meteorological Stations in Project Area**

**Legend**
- Precipitation
- Climate

**Elevation m**
- High: 8763.09
- Low: 44

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**Monitoring Climate**

- Climate Station
- Precipitation Station

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**Location Map: Project Catchments**
**NATURE OF WATER AVAILABILITY**

Predicted Low Flow Condition = 500 L/s  
Measured Low Flow Condition = 97 L/s

Predicted Low Flow Condition = 1900 L/s  
Measured Low Flow Condition = 1020 L/s
CLIMATIC ISSUES

All Nepal Temperature Trend

\[ y = 0.0435x + 19.268 \]

Winter (December-February) Precipitation in Nepal

\[ y = 0.0069x + 47.408 \]

\[ y = -1.419x + 2904.1 \]

(Nepal, 2015)
TEMPERATURE TRENDS

Nepal (1971-2012)

<table>
<thead>
<tr>
<th>Tmax</th>
<th>Tmin</th>
<th>Tave</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.11</td>
<td>-0.04</td>
<td>0.025</td>
</tr>
</tbody>
</table>

(IPCC, 2014)

(DHM/NHMRC, 2015)
Hot Days and Cold Days in Bhairahawa Airport
(Station No. 705)

y = 0.3678x - Ta
R² = 0.1665

y = 0.2291x - Ta
R² = 0.1362

Number of hot days

Number of cold days

7 Dec 2016

(NSA Terra Satellite, 2016)
## TEMPERATURE TRENDS (°C/YEAR)

<table>
<thead>
<tr>
<th>Index No</th>
<th>Location</th>
<th>Maximum</th>
<th>Minimum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Average</td>
<td>Extreme</td>
</tr>
<tr>
<td>1030</td>
<td>Kathmandu</td>
<td>0.069</td>
<td>0.058</td>
</tr>
<tr>
<td>1206</td>
<td>Okhaldhunga</td>
<td>0.058</td>
<td>0.052</td>
</tr>
<tr>
<td>909</td>
<td>Simara</td>
<td>0.008</td>
<td>0.005</td>
</tr>
<tr>
<td>1111</td>
<td>Janakpur</td>
<td>0.010</td>
<td>0.020</td>
</tr>
<tr>
<td>705</td>
<td>Bhairahawa</td>
<td>0.017</td>
<td>0.001</td>
</tr>
</tbody>
</table>

- **Kathmandu**: 0.6°C/decade
- **Okhaldhunga**: 0.1°C/decade
PREcipitation trends

DHM/NHMRc, 2015

Nepal
Pmax 31 mm/yr
Pmin -42 mm/yr
Pave 0.7 mm/yr

(IPCC, 2015)

(IPCC, 2013)
# Precipitation Trends

<table>
<thead>
<tr>
<th>Index No.</th>
<th>Location</th>
<th>Period of record</th>
<th>Annual mm/year</th>
<th>Monsoon mm/year</th>
<th>Daily Extreme mm/day/year</th>
<th>Dry Season mm/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>703</td>
<td>Butwal</td>
<td>1954-2014</td>
<td>-7.4</td>
<td>-7.1</td>
<td>-1.5</td>
<td>0.4</td>
</tr>
<tr>
<td>704</td>
<td>Beluwa</td>
<td>1958-2015</td>
<td>6.4</td>
<td>3.7</td>
<td>-0.1</td>
<td>0.8</td>
</tr>
<tr>
<td>705</td>
<td>Bhairahawa Airport</td>
<td>1966-2015</td>
<td>-0.5</td>
<td>8</td>
<td>0.2</td>
<td>0.9</td>
</tr>
<tr>
<td>707</td>
<td>Bhairahawa Agri Stn</td>
<td>1968-2014</td>
<td>5</td>
<td>5.6</td>
<td>-0.7</td>
<td>0.3</td>
</tr>
<tr>
<td>716</td>
<td>Taulihawa</td>
<td>1979-2014</td>
<td>-5.8</td>
<td>-5.2</td>
<td>-0.5</td>
<td>-1</td>
</tr>
<tr>
<td>721</td>
<td>Patharkot</td>
<td>1972-2015</td>
<td>-4.26</td>
<td>-5.39</td>
<td>0.4</td>
<td>1</td>
</tr>
<tr>
<td>728</td>
<td>Simari</td>
<td>1981-2014</td>
<td>7.7</td>
<td>0.869</td>
<td>2.39</td>
<td>0.9</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td></td>
<td></td>
<td><strong>0.16</strong></td>
<td><strong>0.07</strong></td>
<td><strong>0.03</strong></td>
<td><strong>0.47</strong></td>
</tr>
</tbody>
</table>
y = -0.0843x + 1815.4
R² = 1E-05

y = -2.6326x + 6654.5
R² = 0.0124

y = -31.536x + 64941
R² = 0.2605

y = -23.157x + 47858
R² = 0.1942
RAINLESS PERIOD IN BHAIRAHAWA - ANNUAL

- 2 consecutive days
- 7 Consecutive days
- 15 consecutive days

\[ y = 0.1001x + 39.962 \]  
\[ R^2 = 0.0092 \]

\[ y = 0.4227x - 679.68 \]  
\[ R^2 = 0.0786 \]

\[ y = 0.5423x - 970.15 \]  
\[ R^2 = 0.0817 \]
EXTREME EVENTS

<table>
<thead>
<tr>
<th>Date</th>
<th>Bhairahawa</th>
<th>Giruwari</th>
<th>Shringighat</th>
<th>Beluwa</th>
<th>Patharkot</th>
</tr>
</thead>
<tbody>
<tr>
<td>22-Jul-16</td>
<td>123.1</td>
<td>122</td>
<td>51.6</td>
<td>225.3</td>
<td>72</td>
</tr>
<tr>
<td>23-Jul-16</td>
<td>102.4</td>
<td>365</td>
<td>13.6</td>
<td>67.5</td>
<td>8.2</td>
</tr>
<tr>
<td>24-Jul-16</td>
<td>1.9</td>
<td>124.4</td>
<td>127</td>
<td>13.5</td>
<td>22</td>
</tr>
<tr>
<td>25-Jul-16</td>
<td>51.3</td>
<td>11</td>
<td>83</td>
<td>83.5</td>
<td>25.3</td>
</tr>
<tr>
<td>26-Jul-16</td>
<td>72.2</td>
<td>170.2</td>
<td>411</td>
<td>82.8</td>
<td>260</td>
</tr>
</tbody>
</table>

Singeghat irrigation scheme with the highest flood level observed on 27 July 2016.

Q = 566 m³/s

100 year precipitation on 30 June-1 July 2015

1 May 2016 in Giruwari
CLIMATE PROJECTIONS
CONCLUSIONS

0.3°C/decade

Extremities

P -74 to 77 mm per decade
RECOMMENDATION: INFORMATION-BASED RESILIENCE

Involving stakeholders and communities in Weather/Climate Monitoring

Promote Research

Update/Upgrade Reference Station

Information: Climate and Weather Information: Real Time, Predictions, Projections and Long-Term Assessments.