CLIMATE CHANGE PATTERNS AND PROJECTIONS

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13 December 2016
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

\[ y = 0.0069x + 47.408 \]
\[ y = -1.419x + 2904.1 \]
TEMPERATURE TRENDS

Global average temperature anomaly (1850-2015)

[Graph showing temperature anomaly from 1850 to 2015]

Recent Global Temperature Trends
(Reference Period: 1981-2010)

[Graph showing recent global temperature trends from 1979 to 2016]

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>

(DHM/NHMRC, 2015)

(IPCC, 2014)

Source: Tisdale (2016)
Hot Days and Cold Days in Bhairahawa Airport (Station No. 705)

\[ y = 0.3678x - 513.2 \]
\[ R^2 = 0.16655 \]

\[ y = 0.2291x - 452.53 \]
\[ R^2 = 0.13618 \]

Number of Days

Number of hot days

Number of cold days

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

<table>
<thead>
<tr>
<th>Index No</th>
<th>Location</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Average</th>
<th>Extreme</th>
<th>Average</th>
<th>Extreme</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>1030</td>
<td>Kathmandu</td>
<td>0.069</td>
<td>0.058</td>
<td>0.033</td>
<td>0.043</td>
<td>0.051</td>
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<tr>
<td>1206</td>
<td>Okhaldhunga</td>
<td>0.058</td>
<td>0.052</td>
<td>0.035</td>
<td>0.000</td>
<td>0.035</td>
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<tr>
<td>909</td>
<td>Simara</td>
<td>0.008</td>
<td>0.005</td>
<td>0.022</td>
<td>-0.011</td>
<td>0.015</td>
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<td></td>
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<tr>
<td>1111</td>
<td>Janakpur</td>
<td>0.010</td>
<td>0.020</td>
<td>0.030</td>
<td>-0.020</td>
<td>0.019</td>
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<tr>
<td>705</td>
<td>Bhairahawa</td>
<td>0.017</td>
<td>0.001</td>
<td>0.027</td>
<td>0.022</td>
<td>0.022</td>
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</table>

*0.6°C/decade*

*0.1°C/decade*
PRECEPITATION TRENDS

DHM/NHMRC, 2015

Pmax  31
Pmin -42
Pave  0.7
PRECEPIATION: BHAIRAHAWA AIRPORT (STN NO. 705)

- **Annual**
  - $y = -0.0843x + 1815.4$
  - $R^2 = 1.1E-05$

- **Monsoon**
  - $y = -2.6326x + 6654.5$
  - $R^2 = 0.01236$

- **Recent: Annual**
  - $y = -31.536x + 64941$
  - $R^2 = 0.26046$

- **Recent: Monsoon**
  - $y = -23.157x + 47858$
  - $R^2 = 0.19422$

**Precipitation (mm)**

**X-axis:** Years

**Y-axis:** Precipitation (mm)
- 0, 500, 1000, 1500, 2000, 2500, 3000
RAINLESS PERIOD - ANNUAL

- 2 consecutive days
  - Equation: y = 0.1001x + 39.962
  - R² = 0.00924

- 7 Consecutive days
  - Equation: y = 0.4227x - 679.68
  - R² = 0.07864

- 15 consecutive days
  - Equation: y = 0.5423x - 970.15
  - R² = 0.08172

NUMBER OF DAYS

2 consecutive days
7 consecutive days
15 consecutive days
# 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></td>
<td><strong>Western Terai</strong></td>
<td></td>
<td></td>
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<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>
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<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>
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<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>
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<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>
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<td>716</td>
<td>Taulihawa</td>
<td>1979-2014</td>
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<td>-5.2</td>
<td>-0.5</td>
<td>-1</td>
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<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>
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<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>
Singeihat irrigation scheme with the highest flood level observed on 27 July 2016.

1 May 2016 in Giruwari
CLIMATE IN PROJECT AREAS

Raingauge at Basantpur (Giruwari)

Maximum
Minimum
Thermometer:
Basantapur
(Giruwari)
CONCLUSIONS

0.3°C/decade

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

Promote Research

Update/Upgrade Reference Station

Involve community in Weather/Climate Monitoring

Information: Climate and Weather Information: Real Time, Predictions, Projections and Long-Term Assessments for... Research: to reduce Uncertainty and understand...