# Regional Study Course on Climate Change, hydrological drought and flood

**Department of Energy, Ministry of Economic Affairs, Thimpu, Bhutan**

**18 -24 April 2010**

**Jointly convened by DoE, UNESCO and NVE**

HH: Hege Hisdal, HvL = Henny van Lanen, SB=Stein Beldring, GR = Gwyn Rees and/or Alan Gustard, LT = Lena Tallaksen, others?

## Timetable

| Sunday 18 April | Monday 19 April | Tuesday 20 April | Wednesday 21 April | Thursday 22 April | Friday 23 April |
|---|---|---|---|---|---|
| | **Lectures**<br>09:00-10:30<br>Hydrology of the Hidu-Kush Himalaya region (NN) 30<br><br>Projected climate change – impact on hydrology<br>(SB) 60 | **Lectures**<br>09:00-10:30<br>Frequency analysis – at site analysis (Ch. 6 + floods)(LT, HH) 90 | **Field trip**<br>09:00-18:00 | **Presentations**<br>09.00 – 10.00<br><br>Low flow study in Bhutan<br>(chair: HH)<br><br>**Workshops** [1] [2]<br>10.00 – 10.30<br><br>**Workshop A**<br>Drought frequency and low flow analysis (LT,HH)<br><br>**Workshop B**<br>Human impacts & climate change<br>(HvL,SBE) | **Workshops**<br>09.00 – 10.30<br><br>**Workshop A**<br>Drought frequency and low flow analysis (LT,HH)<br><br>**Workshop B**<br>Human impacts climate change<br>(HvL,SBE) |
| | 10.30 Break | 10.30 Break | | 10.30 Break | 10.30 Break |
| | **Lectures**<br>11.00 – 12.30<br><br>Hydrological floods and drought impact of climate change<br>(Ch. 2 & other material)(HH) 30<br><br>Drought generating processes<br>(HvL) 30 | **Lectures**<br>11:00-12:30<br><br>Regionalisation procedures and estimation at the ungauged sites, incl. examples (Ch. 8+ floods)(LT, HH) 90 | | **Workshops**<br>12.00 – 12.30<br><br>**Workshop A**<br>Drought frequency and low flow analysis<br>**Workshop B**<br>Human impacts & climate change | **Workshops**<br>11.00 – 12.30<br><br>**Workshop A**<br>Drought frequency and low flow analysis<br>**Workshop B**<br>Human impacts & climate change |

[1] Participants choose for Workshop A or B (2 parallel workshops).

[2] A detailed programme for the two parallel workshops is given below.

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|---|---|---|---|---|---|
| | Flood generating processes (New material needed) (?) 30 | | | | |
| | 12.30 – 14.00 Lunchtime | 12.30 – 14.00 Lunchtime | | 12.30 – 14.00 Lunchtime | 12.30 – 14.00 Lunchtime |
| **Opening**<br>17.00-19.00<br><br>Opening address[3]<br>(DoE, UNESCO) 30[4]<br><br>Welcome and introduction to the Study course<br>Course programme (HH) 15<br><br>Introduction lectures and participants 30<br><br>Introduction to CC, Hydrological drought and Floods<br>CC (IPCC summary) (SBE) 10<br>Hyd. Drought (Ch. 1) (LT) 10<br>Floods (New material) (HH?) 10<br><br>Domestic information<br>(DoE) 10 | **Lectures**<br>14.00 – 15.30<br><br>Hydrological data for flood and drought analysis<br>(Ch. 4)(GR/AGU) 60<br><br>Hydrological drought characteristics – definition, estimation and recommendations, part 2 (Ch. 5)(HH) 30 | **Lectures**<br>14.00 – 15.30<br><br>Human Influences, incl. impact of climate change, introduction to self-guided tour<br>(Ch. 9)(HvL,SBE) 60<br><br>Hydrological data and Operational Applications<br>(Ch. 4, 11)(GR/AGU) 30 | | **Workshops**<br>14.00 – 15.30<br><br>**Workshop A**<br>Drought frequency and low flow analysis<br><br>**Workshop B**<br>Human impacts & climate change | **Workshop** [5]<br>14.00 – 15.30<br><br>Presentation by participants and discussion of<br>Workshop A 45<br><br>Presentation by participants and discussion of<br>Workshop B 45 |
| | 15.30 Break | 15.30 Break | | 15.30 Break | 15.30 Break |
| 19.00 Icebreaker reception | **Presentations Participants, etc.**<br>16.00 – 17.00<br><br>(plenary) (chair: SD) | **Presentations Participants, etc.**<br>16.00 – 17.00<br><br>(plenary) (chair: SD) | | **Workshops**<br>16.00– 18.00<br><br>**Workshop A**<br>Drought frequency and low flow analysis<br><br>**Workshop B**<br>Human impacts & climate change | **Closing Session**<br>16.00– 18.00<br><br>General discussion 30 (ALL,HH)<br><br>16.30<br>Study course Review and close<br>(ALL,LT,HvL) |

[3] DoE representative, UNESCO representative
[4] Estimated duration, e.g. 30 minutes
[5] Plenary session

**Thursday 22nd and Friday 23rd April two parallel workshops will be convened: Workshop A: Drought frequency and low flow analysis and Workshop B: Human impacts – climate change (BILAN/HBV).**

## DETAILED PROGRAMME

| **Workshop A: Drought frequency and low flow analysis (LT, HH)** | **Workshop B Human impacts – climate change (HvL,SBE)** |
|---|---|
| | **Focus floods and droughts** |
| **Thursday, 22 April** | **Thursday, 22 April** |
| 10:00-10:30<br>- Introduction and objectives of Workshop A<br>- Presentation of the case<br>- | 10:00-10:30<br>- Introduction and objectives of Workshop B<br>- Modelling concept of BILAN/HBV (two models – same climate input – compare results?)<br>- |
| 10:30-11:00 Break | 10:30-11:00 Break |
| 11:00-12:30<br>- Presentation and demonstration of computer programs<br>- Discussion & Questions<br>- Data preparation and exploratory data analysis using software from the CD | 11:00-12:30<br>- Impact of climate change: approach<br>- Catchment description<br>- Description of input file for BILAN<br>- Compilation of input file (students; 1 PC per 2 students)<br>- Model calibration - parameter optimization (groups of 2 students) |
| 12:30-14:00 Lunchtime | 12:30-14:00 Lunchtime |
| 14:00-15:30<br>- Prepare summary of key low flow or drought characteristics for the given streamflow stations | 14:00-15:30<br>- Processing results for reference situation and interpretation (groups of 2 students)<br>- Discussing results of reference situation (whole group, lead: HvL,SBE) |
| 15:30-16:00 Break | 15:30-16:00 Break |
| 15:30-18:00<br>- Discussion of the results in the whole group | 15:30-18:00<br>- Climate change scenarios (whole group, lead: HvL,SBE)<br>- Adaptation of input file (groups of 2 students)<br>- Start of processing of results scenario study (groups of 2 students) |
| **Friday 23 April** | **Friday 23 April** |
| 09:00-10:30<br>- Finalising of results according to tasks defined in the case<br>- Preparation for presentation of case | 09:00-10:30<br>- Finalization of processing of results climate change study and interpretation (groups of 2 students) |
| 10:30-11:00 Break | 10:30-11:00 Break |
| 11:00-12:30<br>- Preparation for presentation of case and compilation of powerpoint presentation | 11:00-12:30<br>- Preparation for presentation, compilation powerpoint presentation Human Influence – climate change (students) |