Historical Data Report for BMD (Bangladesh Meteorological Department)

Overview

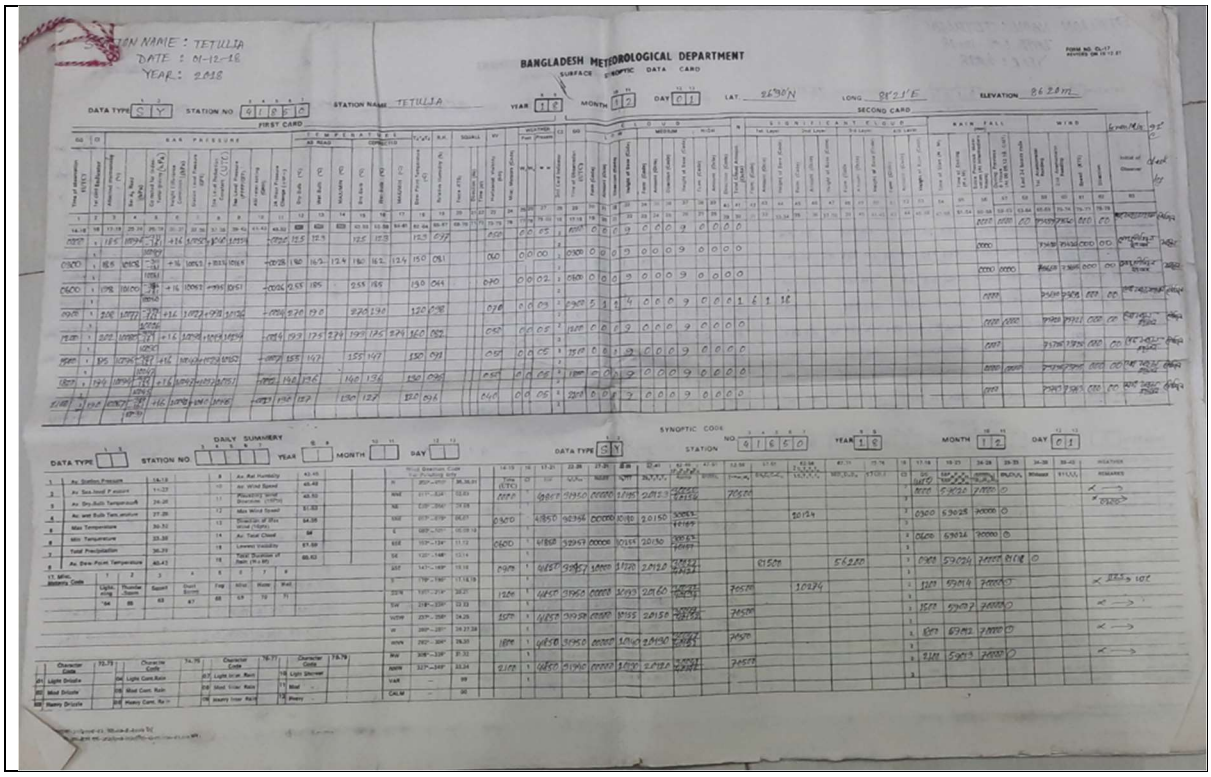
This visit was at the request of BMG for support to improve their system for climate data rescue and management. The current system was well outlined by Nayma Shukla, and her presentation is provided in appendix 1.

The current data management system

BMD climate division currently use their own, Fortran based data management system. It runs smoothly, both for the historical data in their system, and for new incoming data.

There are 61 main stations, but only 48 currently report to the data processing section. Some are relatively recent, and 35 stations have long records.

Their data are 3 hourly. They are entered on daily forms and sent, in Excel, also daily, by staff from each of the main stations. There are then checked, by staff in the climatology section and added into the current data management system. The checking is at two “levels”, first from the Excel data, and secondly at the end of the month. The paper records are sent at the end of each month. There is one A3 sheet for each day. There is therefore a large paper archive!



The climatology staff report discrepancies back to the stations. The corrected data are entered to the Fortran-based system.

Two more forms are also sent, from the stations, at the end of each month. One is for sunshine. This is both in Excel and as hard copy. It provides the hourly, and daily, sunshine record, read from the sunshine cards. The daily values are added to the data management system. I queried why the hourly values are not included. The reason stated was that they are not recognized by WMO. To me the extra detail – which is similar to the within-day data, that now arrives from the automatic stations, would not be worth a large effort, but since it arrives already in digital form, it seems a shame to discard it? (In some Francophone countries these data are available on a half-day basis.)

The second additional form is for rainfall. It provides the 3 hour rainfall values for the month. It is sent as an Excel file and also as a hard copy. These three hour rainfall values are included, from here in the current database. There seems an oddity here, that the 3 hour rainfall data is supplied twice. It is one of the elements on the daily form, and also sent, on a monthly basis with the sunshine form. I must check this!

The main database therefore includes the xxx elements, each on a 3-hour basis, plus the daily sunshine values. I have questioned why the hourly sunshine values are not included, given they are provided, in Excel, by each station. The answer was related to WMO only suggesting daily values. I find this odd, particularly given that Francophone countries include half-daily values. This is not a major point. I would not suggest computerizing the hourly values. But given that the current routine does computerize them, then I wonder why they should not be included. I would like to check on the WMO view on this element.

I dwell on this point simply because the sunshine records are very impressive. In most countries I find very sparse records, and they are not considered of particular importance, particularly given the time needed to provide the data. This is a wonderful resource here. Let's make full use of it.

The data in the headquarters then go through a 4 stage system. The first, by the xxx staff at headquarters, transfers them, from Excel into a Fortran, readable form from where there are initial quality control checks. For example is the calculated 3 hour tmax more than tmin? Any discrepancies are reported back to the station. This is all done on the daily data, so corrections can be made before the end of each month.

The steps from here are undertaken by the two key staff in the climatology section. The second step, in Fortran, produces one file per year , per station for all the stations. It is for all the elements. It is updated each xxx and therefore gradually builds into the current yearly file.

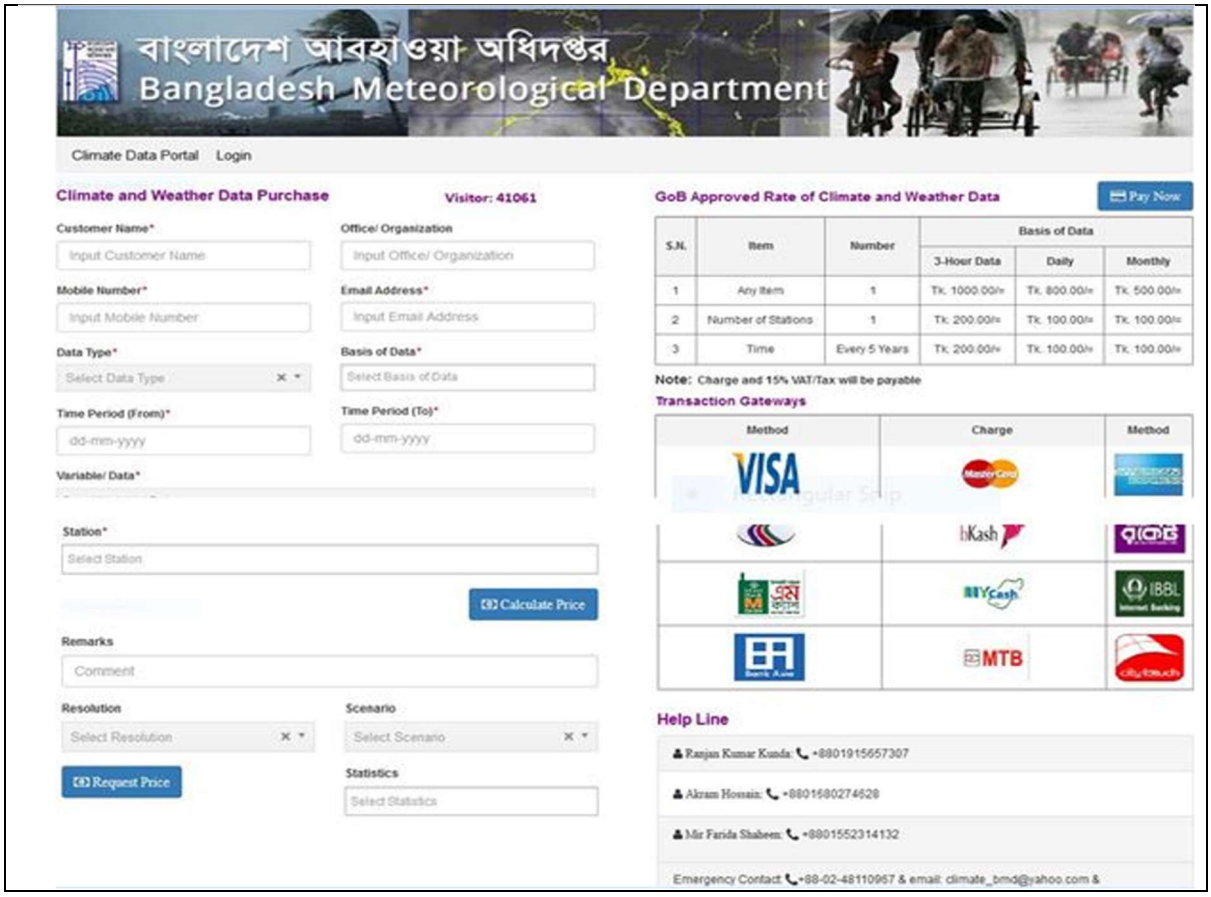
Where are the sunshine and the extra rainfall form records at this stage?

The third step separates the files, by element, into a file for each element and for each station.

This is all handled, through Fortran, on Windows machines.

The final step moves to Linux. It still uses Fortran and combines the data for each element over all the stations.

The result, provides data that is easily available and can be supplied to users on request. They may be within BMD or external. If external they start by completing an on-line request form, shown below:



Data are available for external users for up to 15 days prior to the current date. This is an efficient system.

The 3 hour, or summary data may be requested. Providing the data – once payment, if needed, is done is usually within xxx days. Fortran is again used to provide the requested data. A typical request usually takes xxxx minutes to fulfil. The data are usually provided as an Excel file???

The agromet section handles additional climatic elements from a subset of the same stations. They process the data, particularly to provide weekly agromet bulletins. They then regularly send their processed data to the climatology section. There it is added to the data management system to become available to users.

Development of the current system

The current data entry system has been in existence for about five years. Previously the stations sent the paper copies of the data and they were entered by the 17 staff of the climatology section. There are typically about 8 staff at each station, so a total of perhaps 400 staff overall. They were trained in the new (Excel based) system by 2 staff, from climatology, doing a training visit to each station. This was funded locally.

I envisage two possible developments over perhaps the next 18 months to two years. The first is for them to perhaps enter data differently, should the climatology section move to a more modern data management system. The second is for them to produce some local products from the data at their station, and perhaps also from local neighbouring stations.

This sort of change can be prohibitively expensive. But if it could be handled in the same way as the transformation to Excel use, that would be very cost-effective. Hence the introduction of the new

data management and products system should recognize the need for a training of trainers component.

Automatic stations

They also have about 250 automatic stations. There was insufficient time to discuss the details of the current situation with these data, but I understand that most only currently have a short record. I return to this topic in suggestions for the new data management system.

Paper Records

I was keen to see the paper archive. This is huge as all the main (A3) sheets are daily! The paper store is in 2 parts. The last few years are in the main building, while the old records are stored separately. I was unable to gain access to the old records as a ky to the room could not be located.

Apparently 5 million of these records were photographed in the recent World Bank project. In that exercise climatology were apparently keen that the project should work backwards. The World Bank insisted on working forwards, on the logical grounds that they oldest records would be in the greatest need, because they would have decayed most. However, there were also apparently many gaps in the sheets that were located.

I was relieved that little could be expected from our project, given its size. The computerized data seem complete, so the only use of the paper archive is to check suspect values. I suggest an initial (large) step on the old data would be to organize the paper records, by station and date. If, as I assume, the management deems this to be too much work, I would be inclined to computerize just the last few years, and use the old store room for something different.

A plan for improvement of the historical data management system

The climatology section is being encouraged by the BMD director, to modernize their data management system, and it is keen to do so. However, they have an effective working system and care must be taken that they do not “throw out the baby with the bath-water”!

This small WMO project originally did not include any face-to-face interaction. However, the addition of a face-to-face component was strongly proposed by Nayma Shukla from the Climate division and 2 one-week visits are now included for both Bangladesh and Uganda. This was an important improvement. This first visit included the exploration of the possible role of the R-Instat software in their service

In this first visit we explored together, whether R-Instat could support any improvements in their historical data rescue and management. R-Instat was designed initially to support the easy implementation of a range of products from well managed data. It is also being increasingly used for data checking and improved quality control and was introduced here, in that context.

We therefore worked together, with R-Instat, on their daily data, from Wednesday to Friday of my visit. I emphasise, Friday, because that is the weekend in Bangladesh. However the 3 main staff members wished to continue with the work, even on their weekend.

On these days we combined a jump straight into using R-Instat to check on the quality of their data, and to isolate possible problems. We included two common problems, namely

1) Data occasionally on non-existent dates, e.g 31 September. This was pleasantly rare, but occurred in a few stations, mainly from 2021. There are various causes, including a mis-typing of the month – so it should have been 31 August.
2) Duplicate values, usually a month at a station accidentally repeated twice. Again this was rare. From first impressions the quality of these data seems excellent.

For simplicity we concentrated on the data supplied daily. We anticipate that the team will repeat these tasks independently (with some zoom support when needed.) They will also make the necessary corrections in their current master copy of the data. This is partly so the second visit can start from the cleaned data and proceed quickly to the production of useful products.

The main improvement that is needed, is to use a modern climate data management system. They have just concluded a multi-year World-Bank project. A data management system was proposed within this project, and apparently specified as one that should use an open-source data management engine, to avoid the payment of future licence fees.

Instead, Clidata was bought within this project and the data processing team recently had a one-week introduction to this software. I wonder why this component was supplied so late in the World Bank project.

They are yet to make use of this software. The staff have requested further training, but been told there is no longer a budget for any further face-to-face support. They are also concerned that the licence fee for Oracle is only to be paid, within the project, for 2 years, and would then have to be funded locally.

The staff and the director were also very keen to explore the possible use of Climsoft for their data management work. This is free and open source. It is currently based on MariaDB, a popular open-source relational database system. I suggest a request be made by the director, to WMO and/or UK Met Office for a 2-stage exploration and possible implementation of Climsoft for BMD.

The first stage could be almost the usual 2-week implementation of Climsoft. Here the first week includes familiarization with the software, and the transfer of the historical data into Climsoft. Much of the second week is usually devoted to the entry of the historical and current data from the automatic stations, as well as more advanced management.

The direct data entry into Climsoft can largely be omitted, because I strongly suggest that, in this first stage we keep the current, Excel-based data entry. (However, they need to appreciate the way data are entered into Climsoft, because it could later be installed in each station and replace the current Excel data entry system.)

I hope these 2 weeks are not simply promotion of Climsoft. While introducing Climsoft they also help BMD to come to a decision on the best way they can migrate to using a modern data management system for their historical data.

I suggest their conclusion will be one of the four possibilities below:

1) They find Climsoft is all they need, and adopt Climsoft.
2) They now appreciate Clidata and adopt it.
3) They keep Clidata at the headquarters, but plan to install Climsoft in each station for an improved data entry system.
4) They keep both Clidata and Climsoft at the HQ and plan to install Climsoft in each station for an improved data entry system.

Initially I suggest they also keep their current Excel/Fortran system (perhaps for about a further year.) They regularly transfer data into Climsoft and/or Clidata. This parallels the way the Ag Met data is currently added into their current system. Those data would also presumably be imported straight into Climsoft/Clidata.

I assume their provision of data to customers would also now be from the Climsoft/Clidata database.

Examining the historical data

The data team were introduced to R-Instat. They used it for 3 days with the specific task of checking the quality of their data. There was no time for a formal introduction. I was relieved that the staff were quickly able to examine their data, and seemed enthusiastic about the tool.

There are further steps that I hope will be feasible before the next planned visit. This would enhance the quality of the data still further, while also demonstrating their new skills and ability to work unaided, or at least with only on-line assistance.

A first task is attached as an appendix to this report. If this is completed it would be sufficient to facilitate the work in the second planned visit. However, if successful, then we plan to examine further components of their data in a similar way.

Next steps

The most important is a request to WMO and UK Met, by the BMD director for support to the climatology division on Climsoft. The usual introduction, by the Climsoft team is a 2-week visit. This would seem appropriate here, particularly given the teams view that the one week on Clidata was insufficient. I anticipate a need for a further (2-week) visit perhaps one year later. This would be conditional on the decisions made, on Clidata and/or Climsoft following the first visit. This visit would assume a successful implementation of the agreed data management tools at the BMD HQ. It would facilitate a transformation of the data work at the 61 stations. The current Excel/Fortran system would be replaced by a more efficient data entry, directly to the data management system. We anticipate there would still be submission of the daily and monthly to the BMD HQ and their quality control would continue.

This current mini-project includes the funds for a second one-week visit. This is designed to introduce a range of products that should now be easy to produce from the improved data. Our funding covers all that of the resource person, but assumes the participant's costs (lunch, etc) would be sourced locally. This requires confirmation by the BMD management.

We discussed other options. The second visit could continue the work on the data checking, and corresponding improvements in the Fortran-based database. We assume this is not needed, because they can undertake tasks such as those in Appendix 2 unaided, or at least without the need for a face-to-face visit.

There should be a discussion also on the number of staff on this second workshop and possible dates.

Appendix 1: The Climate Division

Activities and Development Goals of Climate Division, BMD

Presented by

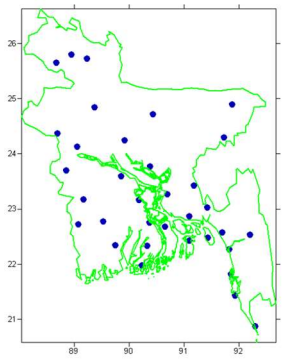
Nayma Baten
(Meteorologist)

Climate Division

Bangladesh Meteorological Department

1

Location of 35 First Class Observatories of BMD



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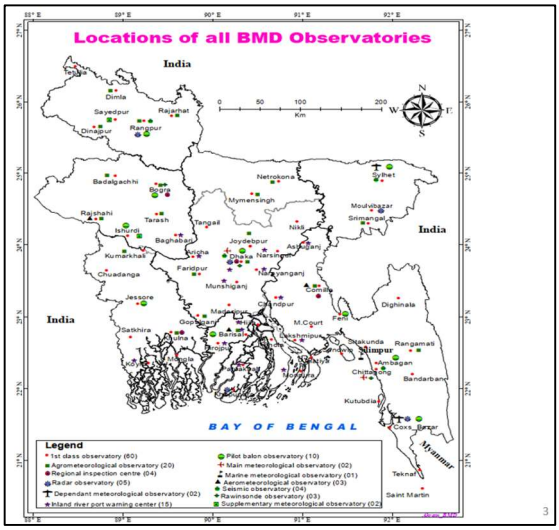
Locations of all BMD Observatories



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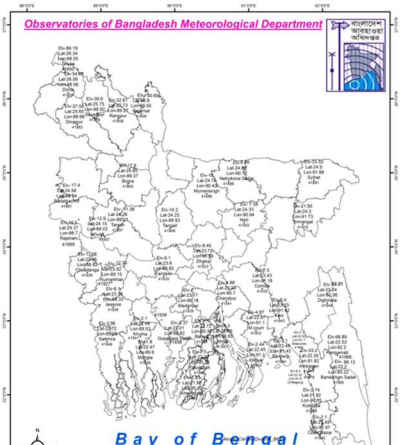
Observatories of Bangladesh Meteorological Department



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Observational Facilities of BMD

Synoptic observatories	61 Nos.
Pilot Observatories	10 Nos.
Rawin Sonde Observatories	04 Nos.
Agro Meteorological Observatories	19 Nos.
RADAR Stations (operational. Out of 5,3 are Doppler Radar)	05 Nos.
Earthquake Monitoring Stations	10 Nos.
Automatic Weather Stations (AWS)	61 Nos.

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Synoptic observatory (Dhaka)

Observers taking observations and resetting the instruments

Observation time and recording

1)BMD takes every three hourly observation

2)Observation time00,03,06,09,12,15,18,and 21UTC

3)Observers take the readings and record in a hard copy named CL-17.

4)After one month they send the bundle of CL-17 to the climate division.

List of surface observation

01	Mean Sea Level Pressure	Surface Data	3-hourly
02	Station Level Pressure	Surface Data	3-hourly
03	Dry Bulb Temperature	Surface Data	3-hourly
04	Wet Bulb Temperature	Surface Data	3-hourly
05	Maximum Temperature	Surface Data	Daily
06	Minimum Temperature	Surface Data	Daily
07	Dew Point Temperature	Surface Data	3-hourly
08	Relative Humidity	Surface Data	3-hourly
09	Horizontal Visibility	Surface Data	3-hourly
10	Present weather	Surface Data	3-hourly
11	Past Weather	Surface Data	3-hourly
12	Form of Cloud	Surface Data	3-hourly
13	Amount of Cloud	Surface Data	3-hourly
14	Direction of Cloud	Surface Data	3-hourly
15	Height of the cloud above ground level	Surface Data	3-hourly
16	Rainfall	Surface Data	Daily up to 2002 & 3-hourly from 2003
17	Wind Speed	Surface Data	3-hourly
18	Wind Direction	Surface Data	3-hourly

List of upper air observation

Click to add subtitle

20	Wind Speed at Different heights	Upper Air Data	6-hourly
21	Wind Direction at Different heights	Upper Air Data	6-hourly
22	Temperature at Different heights	Upper Air Data	6-hourly
23	Relative Humidity at Different heights	Upper Air Data	6-hourly
24	Geopotential Heights with Air Pressure	Upper Air Data	6-hourly

List of Agro-met observations

Grass Minimum Temperature	Agromet Data	12-hourly
Soil temperature at Different Depths	Agromet Data	12-hourly
Pan Water Temperature	Agromet Data	12-hourly
Soil Moisture at Different Depths	Agromet Data	12-hourly
Amount of Dewfall	Agromet Data	12-hourly
Evaporation (pan water system)	Agromet Data	12-hourly
Solar Radiation	Agromet Data	Daily

List of Seismic observations

Date & Time of occurrence of Earthquake	Seismic Data	At the time of occurrence
Location & Depth of Epicentre of Earthquake	Seismic Data	At the time of occurrence
Magnitude & Intensity of Earthquake	Seismic Data	At the time of occurrence

List of Astronomical Data

Sunrise & Sunset of 64 districts	Astronomical Data	Daily
Beginning of Morning Twilight & End of Evening Twilight of 64 districts	Astronomical Data	Daily
Moonrise & Moonset of 64 districts	Astronomical Data	Daily
Sahari & Iftar timings of 64 districts	Astronomical Data	For the month of Ramadan
Moon phases of Bangladesh	Astronomical Data	At the time of occurrence
New Moon Co-ordinates	Astronomical Data	At the time of occurrence
Eclipses , Occultations & Transits	Astronomical Data	At the time of occurrence

Activities of climate division

- Receives recorded meteorological data of 43 observatories once a month by online and post.
- Scrutinizes data manually on regular basis
- Enters scrutinized data in departmental database and performs quality control programs
- Organize data in separate parameter files.
- Calculate, rearrange and reset data in other formats to make it compatible for the research purposes
- Receives all the recorded seismological data of four seismological observatories
- Perform activities for digital archiving of climate data
- Set up the Arabic calendar and enter moon coordinates, sunrise, sunset, moon rising, moon set, and eclipse data on a daily basis.

Activities of climate division

(A) Meteorological Data

Climate division receives all the recorded meteorological data of 43 departmental meteorological observatories of every previous month in every next month by online and post. The received data is scrutinized manually on regular basis. After the manual scrutiny the computer operators enters the scrutinized data into the departmental data base. The punched data is corrected by running quality control programs and corrected data is preserved in the departmental data base on regular basis. Then corrected data is copied and transferred to Linux Software System and is divided into separated parameter files by using Fortran Programming Language. These separated parameters are also preserved in the departmental data base. The preserved data are supplied to various national and international organizations as per their demands by using Linux Software System and Fortran Programming Language in exchange of Government approved fees by treasury chalan and online payment method. The departmental meteorological data base at present contains meteorological data of 1948- August,2022 as recorded by the departmental meteorological observatories.

Agro meteorological Data: Climate Division collect the archived agro meteorological data of 19 Agromet observatories from the Agromet Division of BMD.Climate Division preserve these data in the departmental data base and also supply to various national and international organizations as per their demands by using Linux Software System and Fortran Programming Language in exchange of Government approved fees by treasury chalan and online payment method.

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(B) Seismological Data:

Climate division receives all the recorded seismological data of 10 departmental seismological observatories of every previous month in the next month. The received seismological data is entered in the departmental data base on regular basis by the computer operators. Then the entered data is transferred to Windows Software System.

The preserved seismological data are supplied to various national and international organizations as per their demands in exchange of Government approved fees by treasury challan and online payment method. The departmental seismological data base at present contains seismological data of 1918- August 2022 as recorded by the departmental seismological observatories.

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(C) Astronomical Data:

BMD does not have any astronomical observatory. BMD purchase Indian Astronomical Ephemeris from Positional Astronomical Centre ,Kolkatta for the necessary basic astronomical data of every year.

The list of 1st day of every Arabic month and Islamic Festivals, Moon coordinates and Moon Phases data of every lunar month, daily sunrise-sunset & moonrise-moonset data of every year for 64 districts of Bangladesh, daily sahri-iftar data of every year's Ramadan month for 64 districts of Bangladesh and particulars of every year's solar-lunar eclipses & transits of Mars-Venus over sun are prepared.

The prepared astronomical data are supplied to various national and international organizations as per their demands.

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Software used

1)Penmen Monteith –For Evapotranspiration

2) Warplot-For wind rose

3)CPT-Seasonal forecast

4)GIS-For data analysis

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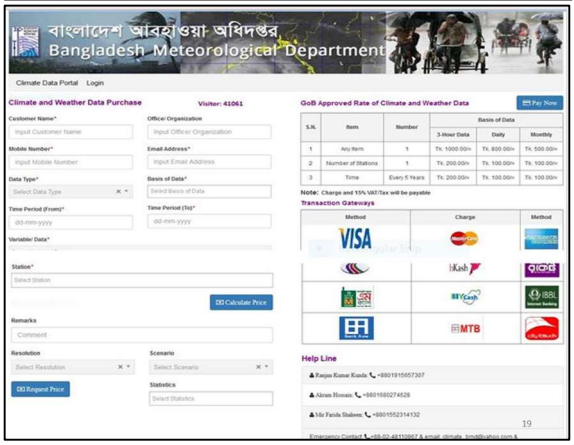

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Developing proposal of climate division

Main Frame Server System

Climate division receives bundle of CL-17 of every previous month in every next month by post. Very recently on line data receiving system through mail introduced. Number of manpower are engaged in data quality control, archiving and processing . To make the system easier, faster, Secure and up to date climate division require at least one main frame server.

Climate Data Management System:

For the better quality control, archiving and processing of departmental data base, climate division must have an up to date Climate Data Management System (CDMS). This will enable BMD to calculate, rearrange and reset in other formats to make it compatible for the research purposes according to the demand of the clients. This rearranged data will be supplied to the various stake holders.

Digital archiving system :

Right from the beginning observers are recording the observations in a hard copy named CL-17. These hard copy are stored in departmental store room. In course of time these hard copy are losing their temper . So, in future missing data rescue procedure may hamper. So, climate division requires a digital data archiving system.

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Climate Prediction System:

In present system climate division is not issuing any climate outlook or seasonal forecast . But it has become a public demand to have a seasonal forecast .For this purpose climate division needs some resource person to trained up the existing selected manpower who will be able to provide seasonal forecast and also needs some necessary software.

Astronomical data processing system:

BMD does not have any astronomical observatory. Hence, for the necessary basic astronomical data of every year BMD purchase Indian Astronomical Ephemeris from Positional Astronomical Centre ,Kolkatta. This makes BMD dependable upon the external resources which makes the whole process very time consuming. To solve this problem, BMD needs own astronomical observatory, historical data base and data processing system.

Publication System:

Climate division does not have their own publication system. But it is possible to publish any journal from climate division that wound become an income source of BMD.

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Thanks

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Appendix 2: Tutorial style instructions for initial data checks

Checking Bangladesh data for duplicate rows and non-existent dates

Roger Stern: 9 October 2024

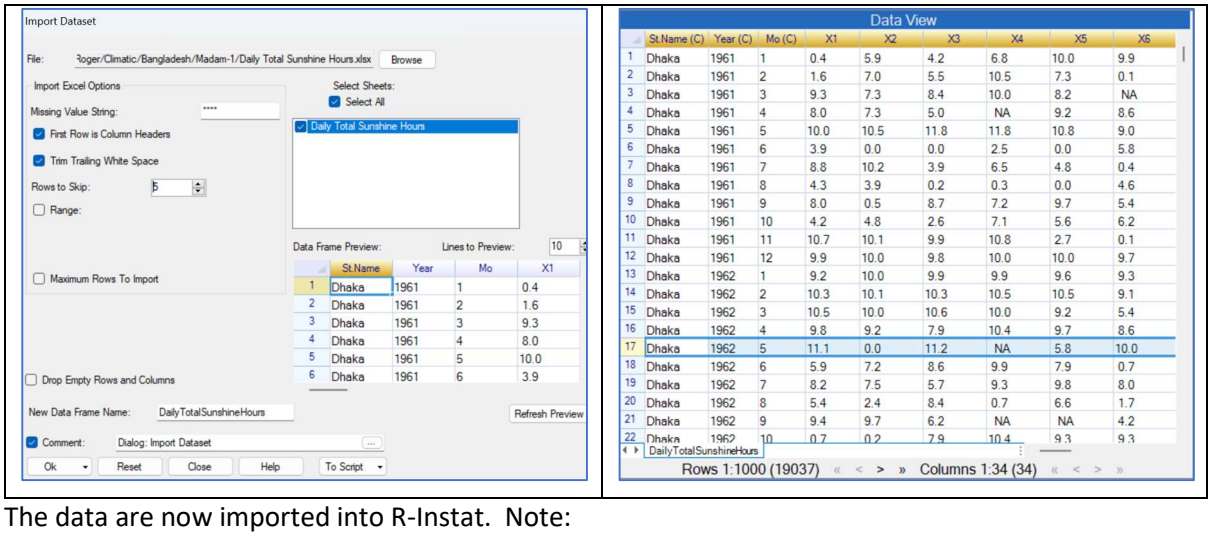
The current database is a very impressive resource. It enables the data processing section to provide users with 3-hour synoptic data for many elements. If daily data are requested, then the 3 hour data are averaged over each day first. In addition, four elements are provided directly on a daily basis. They are rainfall, tmax, tmin and sunshine hours. These four were the only elements investigated directly during the joint week of work.

We found two rare problems with the data from these variables. The first was there was occasionally data on illegal dates, such as 31 September. These were often missing values, or zero for rainfall. Occasionally, however, they were "proper" values. When investigated, the cause was then usually that the month had been given incorrectly. This could be a problem in the master copy of the data, or a fault in the Fortran program that extracted the data and combined them over multiple stations. We hope the team can resolve these issues, so the master copy and the software is still further improved.

We did not have the time, during the week, to study the second problem, which is of duplicate dates. We therefore show here one way this problem can be investigated.

We use the sunshine data. They were provided as csv and as an Excel file. We were not able to read the csv version properly into R-Instat (we are not sure why not), so we started with the Excel version. The file is called Daily Total Sunshine Hours.xlsx.

- Use ***Import from File*** from the front screen, or ***File > Import From File***. ***Browse*** to find the data file.
- ***Click on the Excel sheet***, or on Select All.
- Put ******* as the missing value*** string and set the ***rows to skip to 5***.
- The dialog should be as below left. ***Press Ok***.



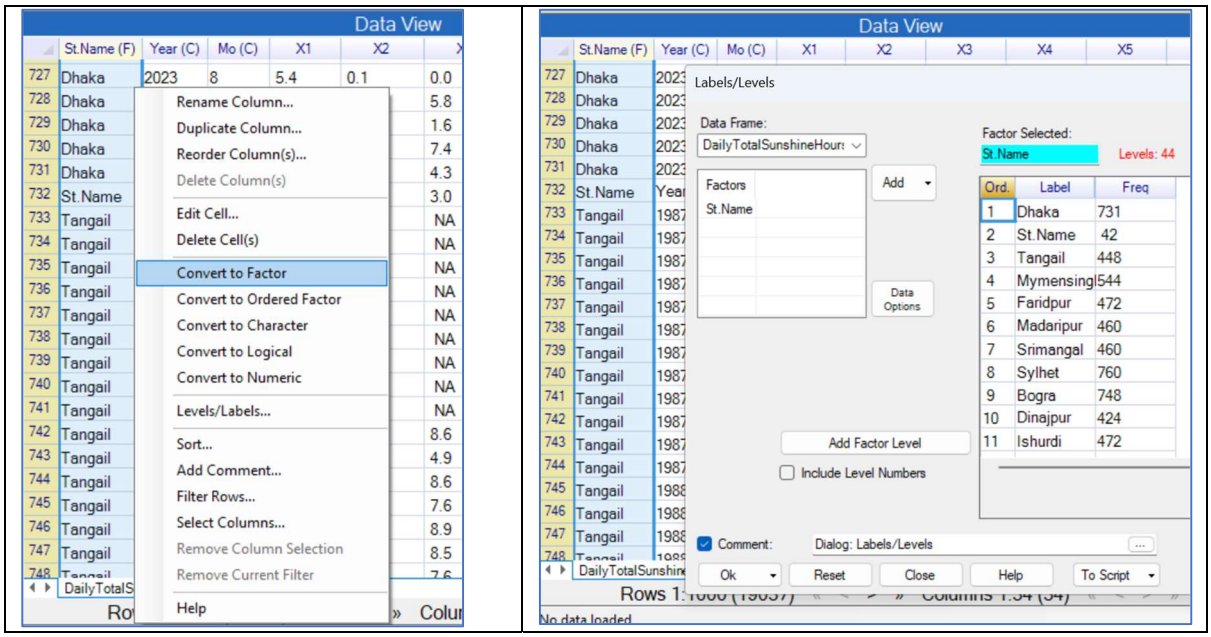
The data are now imported into R-Instat. Note:

- Each row is a month, and there are 19037 months of data.

- There are 34 columns of data, namely the station, year, month and then values for 1st to 31st of the month. This layout is similar to the data in the master copy, though those values are in separate files for each station. Here all the stations are together.
- Looking at the values there are zeros in the data, for example 2nd May 1962 had zero sun. This maybe true, but I wonder whether some zeros may really indicate a missing value?
- Usually, with R-Instat, the layout where a day is a row, is preferred, rather than here, a month. But for checking duplicates, this layout is ideal. That's because the duplicates are usually months.

Start with some "housekeeping" of these data.

➢ **<u>Right-click in the first</u>** (station name) column and choose ***Convert to Factor***, below left.

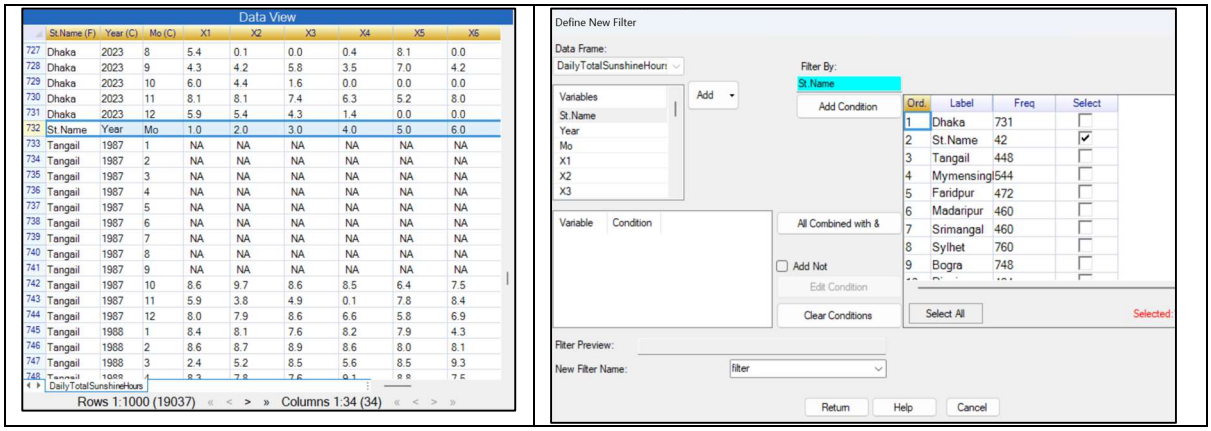


➢ ***Right-click*** again and choose ***Levels/Labels***.

- Notice there are 44 levels (stations), and no missing values in this variable.
- There are 731 months of data for Dhaka, dividing by 12, that's over 60 years.
- The second "station" is called St.Name, which is very odd.
- Note also that the Year and Mo columns have a C after the name.
- So some corrections/housekeeping has to be done!

➢ ***Scroll down*** to the end of the Dhaka data, (***row 732***) see below left.

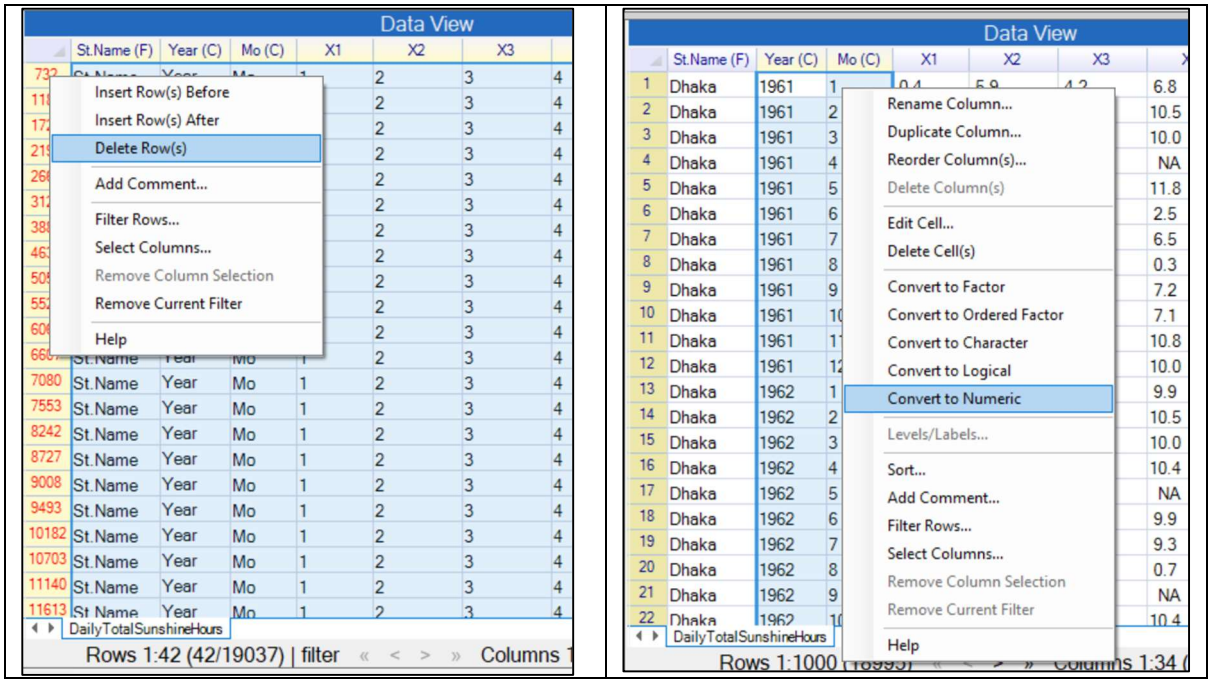
- This shows your Fortran program, has kept this extra row between the data for each station.
- It also explains why the year and month variables are not numeric.
- Fortunately it is easy to correct.



- ***Right-click*** and choose ***Filter Rows***, then ***Define New Filter***.
- **Choose St.Name**, and then ***tick the St.Name factor level***, see above right.
- ***Click Add Condition***, then ***Return***, then ***Ok***.

You now have just the 42 selected rows.

- ***Choose <ctrl> A***, to select them all. Then, ***right-click in the red left-hand column***, below, left and choose ***Delete Rows***.
- ***Right-click*** again and choose ***Remove Current Filter***.
- Select the ***Year and Mo*** columns. ***Right-click*** and use ***Convert to Numeric*** (below right)



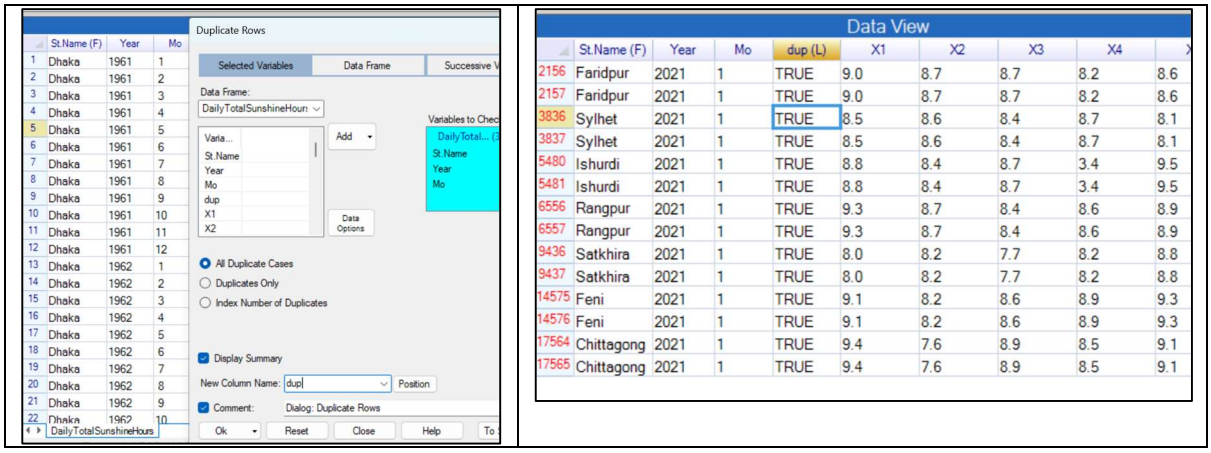
After these preliminaries:

- Use ***Climatic > Tidy Data > Duplicate Rows***. Select the ***Station, Year and Month*** columns below left. Then ***press Ok***.

(Note, earlier this gave an error, but I think it has been fixed. If there is an error, the use the second option in the dialog, Duplicates Only.)

This adds a new variable, called dup, and the output window says it is TRUE on just 14 occasions. (When there are no duplicates this gives zero occasions.)

- ***Filter the data*** to the rows where ***dup == TRUE*** (We filtered a lot last week.)
- The results are below, right.



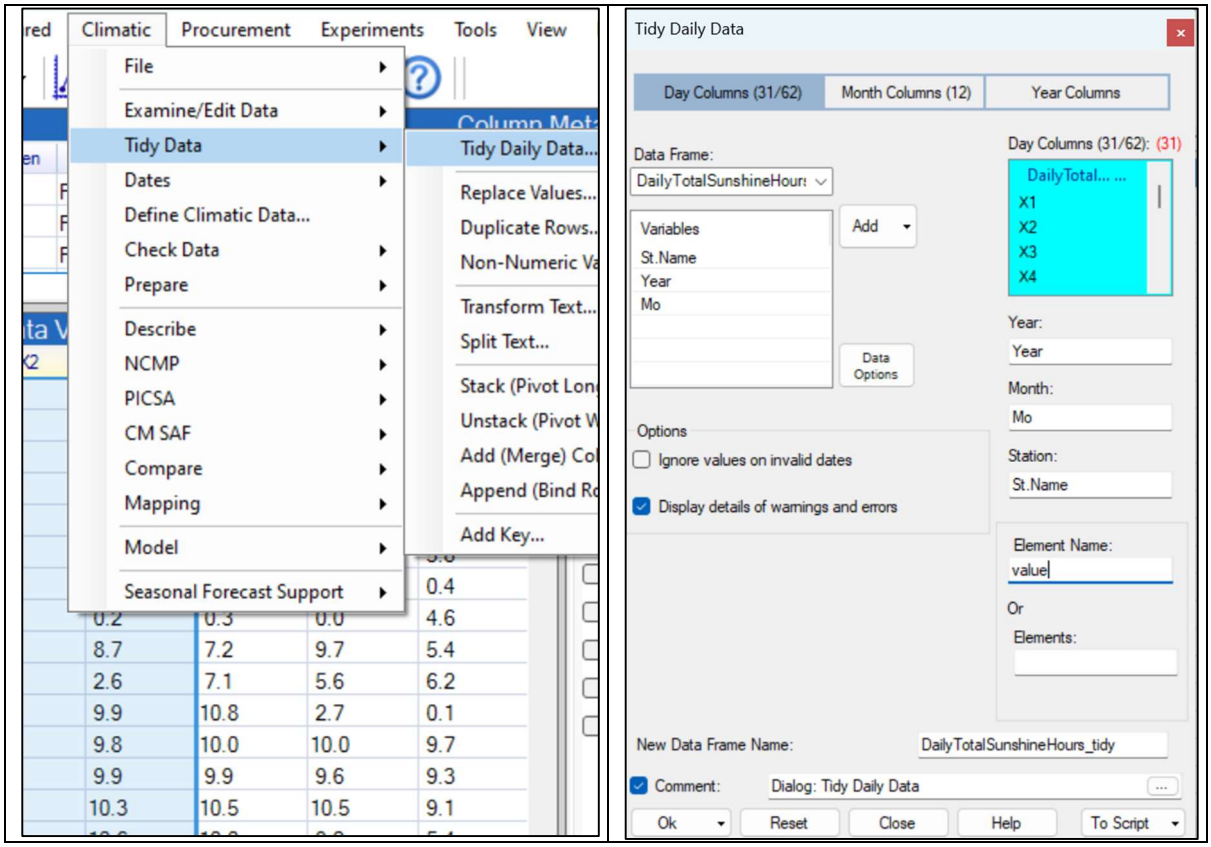
The results show just 7 stations had duplicate rows. This was a January 2021 problem for each of these stations.

I suspect this was a problem in the data, rather than in the Fortran code, that extracts the data. This should be easy to correct.

This is the first exercise, and should be repeated for the other daily variables, namely rain and tmax/tmin. Please also make sure you include all stations in the data each time.

Now the second part, namely a new way to investigate the data on non-existent dates.

- In ***R-Instat delete each second row***, above right, before proceeding to check on the non-existent dates.
- **Right-click** and ***delete the dup variable***.
- Then use ***Climatic > Tidy Data > Tidy Daily Data***, below left.
- Complete the dialog, by putting ***x1-x31 into the multiple receiver***. Then the ***Year, Month and Station*** are also added, below right.
- Then ***press Ok***.



The data are not tidied, because there are values on illegal dates. Instead those days are listed in the output window.

- Click on the ***Maximise in the Output Window*** to see the values listed.

- There were 444 non-existent dates at just 8 stations.
- In 6 of these stations these illegal dates started in 2021. They are Faridpur, Sylhet, Ishurdi, Rangpur, Satkira, and Chittagong.
- In Dhaka they started in 2014.
- I think, in these 7 stations the values are always zero. These should be checked, because (like rain) zero is a permissible value for the sunshine hours.
- In Feni the illegal dates started in 1985 and seem to continue. Also there are at least 3 non-zero values, that probably indicate a real problem. In 2007 June 31 had 6.6 hours. In 2013 April 31 had 7.9 hours and in 2017 June 31 had 1.4 hours.
- I checked only quickly and may have missed some non-zero values.

I hope this helps you make your database even better.

Once the sunshine hours data (for all the 61 stations) is corrected, then I suggest the same method be used for the temperatures and daily rainfall.