Routine to create the first setup in PINEHBV software for a given catchment with the data coming from NEVINA, Sildre and SeNorge. Note that if the format of the file coming from these websites change, csv_to_txt_Sildre_SeNorge.py may not work anymore.

initial :

- under Klima/PINE/PineProj, create a repository with the name of the catchment you will study.
- you will find the PINEHBV executable under Klima/programs (shortcut) or Klima/PINE/Pinesys/bin.

step 1 : download observed data sets

- cactchment parameters: NEVINA
    - search the catchment you want to study (Sod sted)
    - display the flow measurement station : Finn Vannføringsstasjoner > ☑️ Vis alle vannføringindeksstasjoner
    - click on the blue line (river bed) next to the station 🔴
    - generate catchment data : generer nedbørfelt, wait until the catchment appears in the map and generer feltparametere, wait.
    - download catchment data : eksport til shape, wait, last ned shape (if this task takes too much time you should try another day, the website sometimes doesn't work well)
- observed discharge : Sildre
    - make sure you selected the good period of time : take the largest, using the date of the first measurement, then the period will be matched with precipitation and temperature values by csv_to_txt_Sildre_SeNorge.py
    - open with excel and do a copy of the file to get the good separator (a comma). Rename the file 'Catchmentname_downloaded_Discharge.csv'
- meteorological precipitation and temperature : SeNorge (don't take the temperature from Sildre)
    - temperature is the air temperature. We can take the minimum and the maximum but it's better to put the min in both min and max columns concerning the climate projections.
    - rename the files 'Catchmentname_downloaded_Precipitation.csv' and 'Catchmentname_downloaded_Temperature.csv'

step 2 : format the data to PINE input

- complete the setup of csv_to_txt_Sildre_SeNorge.py, ensure it is in the good folder (check Klima_folder_structure.png) and run it.
    - csv_to_txt_Sildre_SeNorge.py will then make a .txt file like this (after correcting the:

Dato	Time	P_mm_*alt*moh	T_minC_*alt*moh	T_maxC_*alt*moh	Q_Myglevatn
dd.mm.yyyy	hh:mm:ss	mm	grC	grC	m3/s

alt is the altitude of the chosen point for the data. The time values will always be zero since we only have daily values for discharge.

    - csv_to_txt_Sildre_SeNorge.py will also create two csv files in the input of BiasCorrect which are the filtered observed values for precipitation and temperature.
- in programs, open PINEHBV.exe > import data > TXT2PINE and choose the .txt that you just made as the input file.
    - number of elements : 4 (precipitation, T_min = T_max, discharge)
    - series name : Input
    - series description : ‘’
    - series creator : your first name
- convert, ok

step 3 : setup creation and parameter file (using PINE)

- Setup → enter the name of the catchment and press autoname.
- precise the parameter file : PINE\PineProj\Catchment\Catchment_par.top (the parameter file doesn’t already exist, it will be created by this process)
- press autoname again
- select the good Input data file (.dat) which is normally at PINE\PineProj\Catchment\ and named catchment.dat (done in step 2)
- save the setup with the name of the catchment (and _setup at the end)
- Parameters → enter the catchment data that you will find in a downloaded pdf (Nedbørfeltparametere) :
    - AREA ⇔ Areal (A)
    - Hypsography : Outlet-Elev1-...-Elev9-Highest ⇔ Hoyde min-max
    - ELEVTEMP= ELEVPREC = altitude of the measurement station (usually given by csv_to_txt_Sildre_SeNorge.py, if not can be found in the downloaded data files at step1).
- Save As, don’t change the name of the parameter file or it would be a problem for the setup.

step 4 : first simulation

- Simulate → starting from the beginning of the hydrological year (01.09) and finishing at the end (31.08). A five year period is good for calibration and validation : modify the year of start time and end time.
- go to results see the graphs and check that the model fits the data (especially check the value of R2 which should be above 0,7 for a good calibration. If not, change period)
- Results → you can plot the simulated and observed runoff to compare visually

step 5 : calibration

- Calibrate → start the automatic process, select a five year period
    - NB : this process stops automatically after a few minutes, be patient !
    - don’t forget to Update parameter file before Exit
- under PINE\PineProj\Catchment\ a folder should have appeared : cal1, with particularly cal1.top : this file contains the last parameters computed by PINE. The setup parameter file should also have been uploaded with computed values.

step 6 : validation

this step ensures that the calibration for the catchment has been well handled.

- redo the step 4 for another period of 5 years
- check the values of R2 and ACC_DIFF.

describe the process with the data coming from the climate models
be careful if moving files, especially parameter files : they have a copy in PINE>Pinesys>bin

TIPS :

when a setup is prepared, we only need to setup > open setup.

interesting values :

To calibrate a model, 5 years of data is good. Same to validate the model.
The model is considerably valid when $0,7<R^2<1$.
ACC_DIFF = accumulated difference of runoff between simulated and real runoff in mm over the whole period of simulation (the more long the period is the more important the accumulated diffrence is). Can be positive and negative as well.
m.o.h = meter over havet = meters above sea level

Tutorials in video for PINE setup creation :

- Installing_PINEHBV
- PreparingData_PINEHBV
- Running_PINEHBV