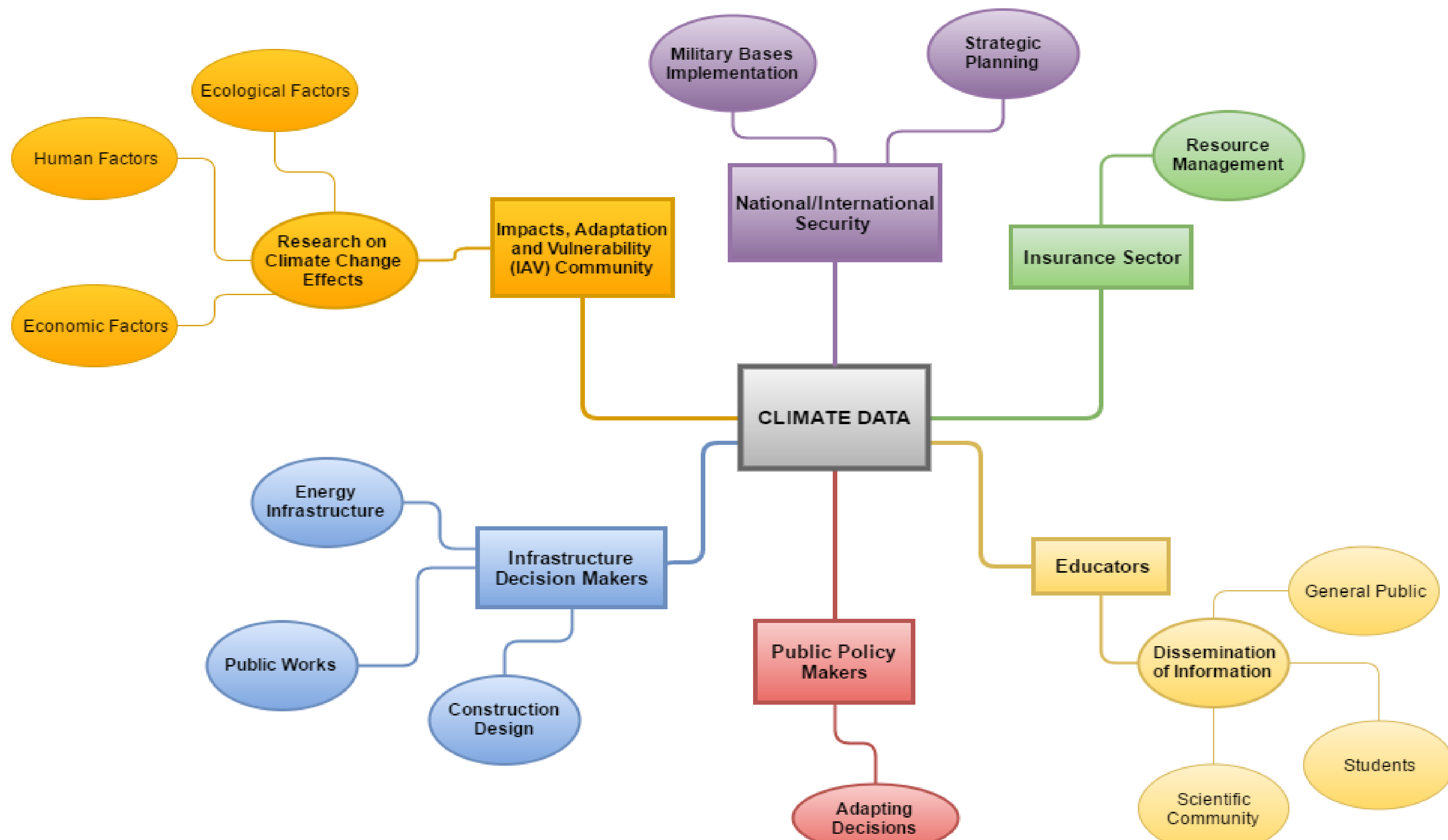


Abstract

This project presents an R package for the weather estimator, which is part of the Integrated Assessment Model (IAM). Climate data users that do not necessarily have expertise on climate, such as educators, public policy makers, farmers and environmental engineers have to do their research based on complex climate models. The project tries to develop a more accessible program for these different types of users by creating a shareable R package. The weather generator code was documented and modularized to be concise with the requirements of the R package format. The results presented a functional R package. The creation of an R package proved to be a good first step on improving the accessibility of weather estimator software and complex climate models.

Background

The purpose of this work is to develop a R package for our weather generator. It goes through the design process behind the creation of this R package and justifies its importance to different climate software users as shown by the following figure:



Schematic of climate data users and applications (Based on National Research Council (U.S.) (2012))

Literature Cited

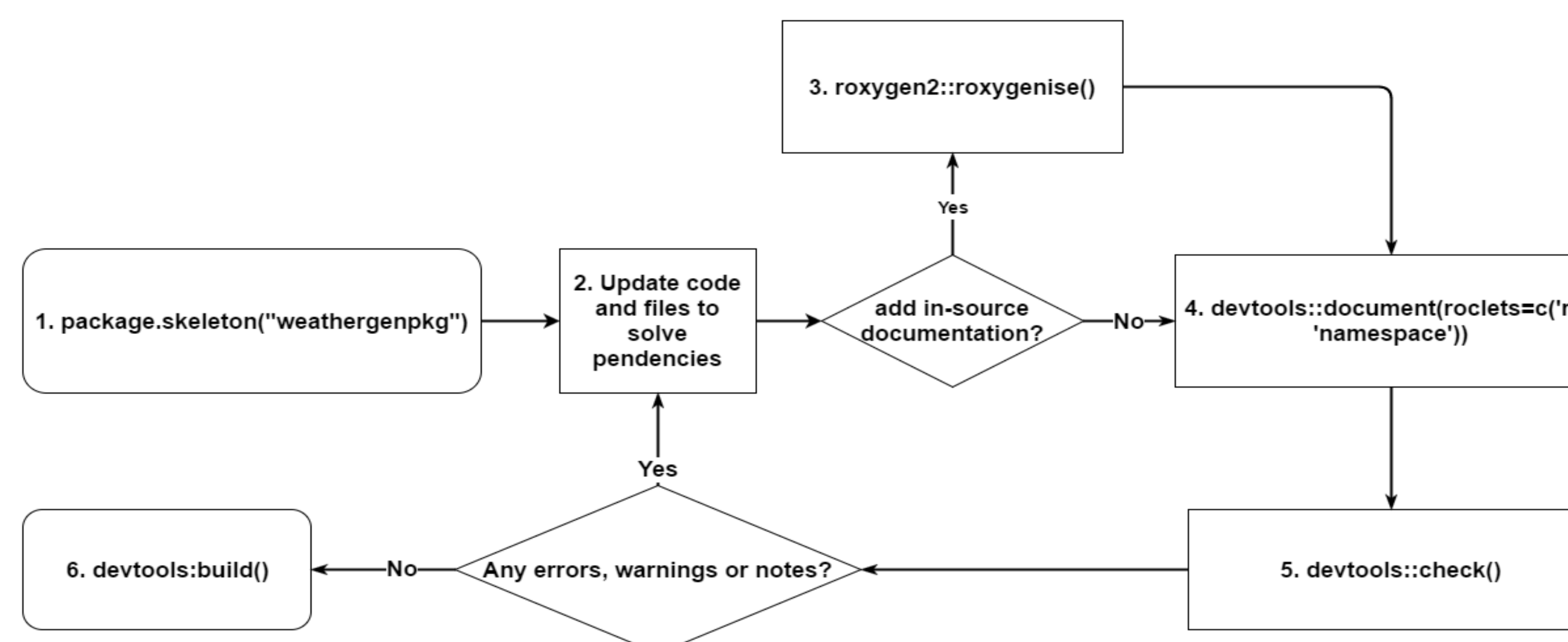
Leisch, F. (2009, September 14). Creating R Packages: A Tutorial. Retrieved June 24, 2016, from <https://cran.r-project.org/doc/contrib/Leisch-CreatingPackages.pdf>
National Research Council (U.S.) (Ed.). (2012). *A national strategy for advancing climate modeling*. Washington, D.C: National Academies Press.

Method

Detailed list of steps used in the creation of the weather estimator package (see flowchart below)

1. Partially automates the process of creating an R package (Leisch, 2009)
2. Three main types of updates: add roxygen2 comments (roxygen2 is a in-source documentation library for R), modify functions and change file content, for example, 'DESCRIPTION'.
3. Sources all functions in the /R folder and updates .Rd and 'NAMESPACE' files.
4. Ensures all documentation is up-to-date. Sources all functions and loads them.
5. Package R CMD check. (Also calls devtools::document())
6. Builds the source package.

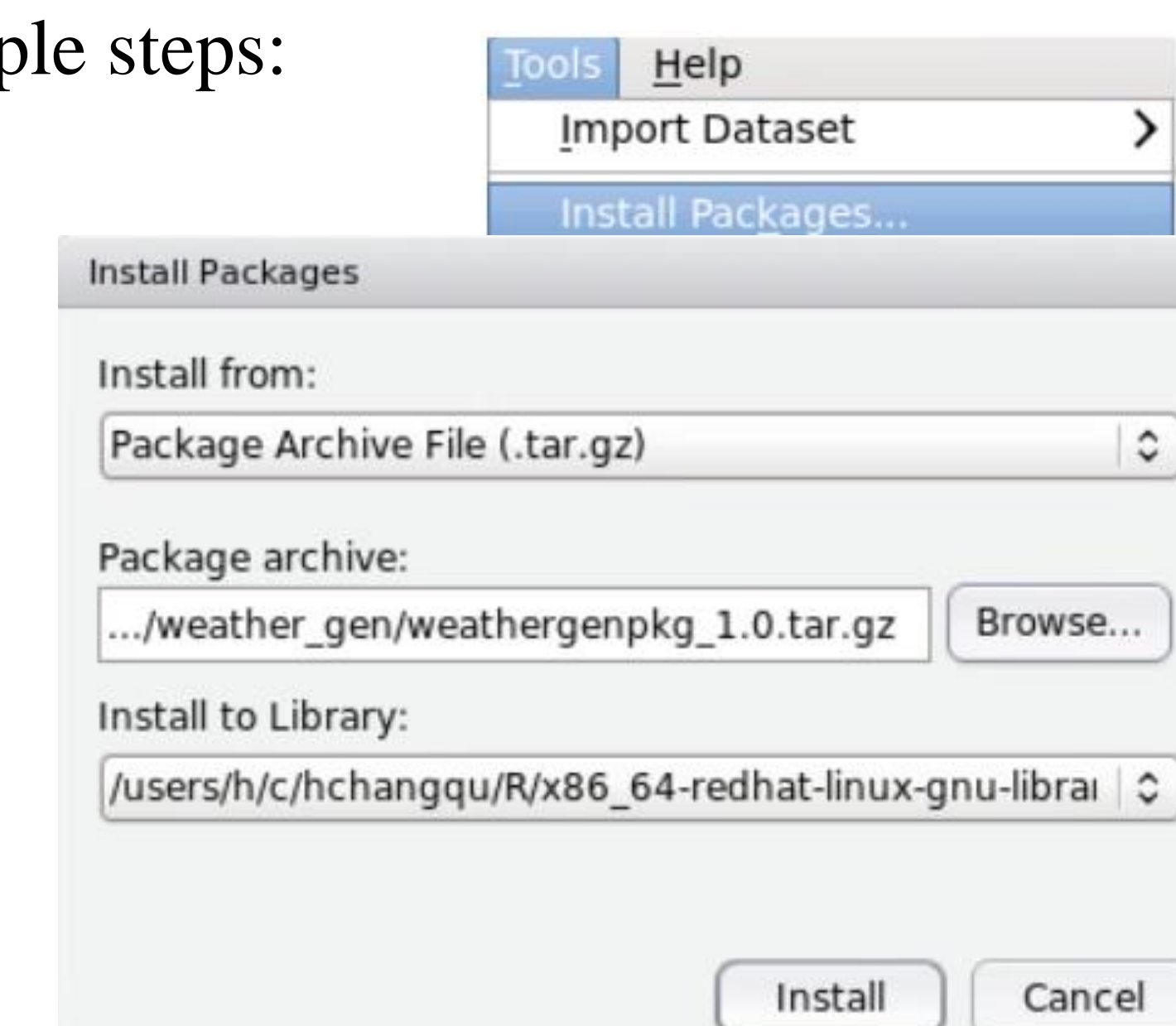
Flowchart of methodology used to create the weather estimator R package



Results

Before we required a lot of intensive coding to run the weather estimator. Now, with the R package, it only takes four simple steps:

1. Open R Studio.
2. Download "weathergenpkg_1.0.tar.gz".
3. Install by going to Tools / Install Packages / Select "weathergenpkg_1.0.tar.gz".
4. Load library.
5. Run weather_gen_full_grid_manual().



```

> library(weathergenpkg)
> weather_gen_full_grid_manual()
[1] "Creating output directory at: /data/output//we_scenario_cmip5.bcca.ipsl-cm5a-mr.1.rcp85.grdim_2_3.daterng_14.PTW_1_1/repl/"
[1] "Resampling at random locations. Number of points: 6"
  
```

Screenshots of steps 3, 4 (top-right) and 5 (top). Taken from R Studio (Version 0.98.1103)

Conclusions

Climate change is a topic of interest not only for climate engineers, but for insurance managers, policy makers, educators, environmentalists and for the Impacts, Adaptation and Vulnerability (IAV) community. The development of packages is considered a great step to make the use of climate data and software more available to different communities and stakeholders.

Good software design is essential to make data sharing possible, external functions readable and results easy to understand for these various types of users.

The best way to improve software accessibility is by creating a user-friendly interface rather than requiring a user to become an expert in a programming language. Future work for this project would be the design and creation of a front-end graphical user interface (GUI), integrated with the weather generator software.

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