

RStudio Project Setup and Zenodo upload

This section walks you through the setup of a basic RStudio project following the good practices for organizing data, scripts, and version control introduced in the [Research projects with R](#) section. As part of this We will initialize `renv` to manage package dependencies, ensuring reproducibility.

Step 1: Create a New RStudio Project

Start by creating a new RStudio project in the root of the `exercise_data` directory. You can name the project as you like. In this example, we will use `Rice_farm_analysis.proj`.

- Open RStudio.
- Click on “File” > “New Project” > “Existing Directory”.
- Select the `exercise_data` folder as the location and give the project a name, for example, `Rice_farm_analysis.proj`.

This creates a `.Rproj` file in the root of your project to help manage the workspace and project-specific settings.

Step 2: Organize Your Data

It’s good practice to organize raw and processed data in separate folders. Let’s start by organizing the data:

- Create a directory `Data/Raw` inside your project folder.
- Move the provided CSV file into this `Data/Raw` directory.

This ensures that your raw data remains untouched and is well-structured.

Step 3: Organize and Split Your Scripts

We’ll now organize the project’s scripts by splitting the original script into separate analysis and visualization scripts.

- Create a `scripts` folder inside your project directory.
- Move the original `RiceFarm_project.R` script into the `scripts` folder.

Now, split the script into two parts: - Create two new scripts named `01_data_analysis.R` and `02_data_visualisation.R`.

- Copy the relevant parts of the original script into these new scripts. For `01_data_analysis.R` copy:

- The call to the relevant library `library(stringr)`
 - Everything before the call to the `ggplot()` function
- Additional steps:
 - Replace `setwd()` function with this snippet to set up relative paths:

```
# Raw data dir
raw_dir <- "Data/Raw"

# vector and create processed data save dir
save_dir <- "Data/Processed"
dir.create(save_dir,
           showWarnings = FALSE,
           recursive = TRUE)
```

- Save `rice_data_summary` to disk after processing:

```
# Save the summarized data
write.csv(rice_data_summary,
          file.path(save_dir, "RiceFarms_summary.csv"),
          row.names = FALSE)
```

- For `02_data_visualisation.R` copy:
 - The call to the relevant library `library(ggplot2)`
 - The call to the functions `ggplot()` and `ggsave()`
- Additional steps:
 - Add code to create output directory for the plots:

```
# Directory for saving plots
plot_dir <- "Output/Visualisations"
dir.create(plot_dir, showWarnings = FALSE, recursive = TRUE)
```

- Add code that loads the summarized data from the processed data folder:

```
# Raw data directory
raw_dir <- "Data/Raw"
# Load csv file of data
rice_data <- read.csv(file.path(raw_dir, "RiceFarms.csv"))
```

Step 4: Add Script Headers

- Add headers to both new scripts. You can use this template:

```
# -----  
# Script Name: [01_data_analysis.R / 02_data_visualisation.R]  
# Project: Rice Farm Analysis  
# Purpose: [Data analysis / Data visualization]  
# Author: [Your Name]  
# Date: [YYYY-MM-DD]  
# -----
```

Step 5: Create a Master Script

As a next step you will create a master script that ties together and runs both the data analysis and visualization scripts.

- In the root of your project, create a new file named `RiceFarm_master.R`
- Add a header as in Step 4.
- Add the following code snippet to the script to source `01_data_analysis.R` and `02_data_visualisation.R`:

```
### =====  
### 01- Data analysis  
### =====  
  
# Source the data analysis script  
source("Scripts/01_data_analysis.R")  
  
### =====  
### 02- Data visualization  
### =====  
  
# Source the data visualization script  
source("Scripts/02_data_visualisation.R")
```

Running this master script will execute both analysis and visualization steps.

Step 6: Initialize renv and Manage Dependencies

To make your project reproducible, we'll use `renv` to manage dependencies. This ensures that the project can be recreated with the same package versions.

- Run the following command in your master script to set up the project-specific environment

```
renv::init()
```

This creates a local library for your project and captures the required packages.

- Once the initialization is complete, run:

```
renv::snapshot()
```

This records the project’s environment in a `renv.lock` file, which is essential for reproducibility.

Step 7: Automate Opening the Master Script

For convenience, we can configure RStudio to automatically open the master script when the project is loaded.

- Open the `.Rprofile` file in the root of your project directory. The file might be hidden. On Windows click “View” > “Show” > “Hidden items” in the explorer and on MacOS click Press Command+Shift+Dot within the root directory to see the file.
- Add the following R code to the `.Rprofile` file:

```
rsetHook("rstudio.sessionInit", function(newSession) {
  if (newSession)
    rstudioapi::navigateToFile('RiceFarm_master.R', line = -1L, column = -1L)
}, action = "append")
```

Step 8: Re-snapshot the Project

After modifying the `.Rprofile` file, it’s important to capture these changes in the `renv.lock` file.

- Run the following command in your master script to ensure that the `rstudioapi` package (which enables automatic script opening) is included in the snapshot:

```
renv::snapshot()
```

==== ## Rstudio project to Zenodo exercise {#sec-Rproj_zenodo_exercise} The following exercise is heavily based on [1]. We have extracted the most relevant parts to explain the workflow. If you are interested in more details, check out their user manual at: <https://cran.r-project.org/web/packages/zen4R/vignettes/zen4R.html>.

If you would prefer to view the exercise script offline, here is a PDF version: [Download exercise instructions](#)

Step 1: Download the resources

- Click [here](#) to download the resources for the exercise: Download resources for exercise
- Unzip the downloaded file and move the folder to a location on your computer where you can easily find it.

Step 1: Install zen4R to access Zenodo through r

For this exercise we will not be using Zenodo directly but Zenodo Sandbox. The Zenodo Sandbox is a separate, secure testing environment where users can explore Zenodo's features without impacting the main platform's publicly accessible data. It allows you to test file uploads, generate test DOIs, and experiment with API integrations. DOIs created in the sandbox are only for testing and use a different prefix. You will need a separate account and access token for the sandbox, distinct from those used on Zenodo's main site.

- Create an account on <https://sandbox.zenodo.org>.

Zenodo can be accessed with r library zen4R to upload, edit, publish and download data.

- Install zen4R library with the following code:

```
#install dependency "remotes"
install.packages("remotes")

#install zen4R
require("remotes")
install_github("eblondel/zen4R")
```

Step 2: Create a new Zenodo record

A zenodo record includes metadata, data and a Digital Object Identifier (DOI) which is automatically generated by Zenodo for all uploads. But before you can add records to Zenodo, you need to access your own account through RStudio.

- Go to <https://sandbox.zenodo.org/account/settings/applications/>.
- Log into your account and then create a new “Personal access token” in the “Applications” section of your account.
- Then run the following code in RStudio to establish the access and create a new record.

```
library(zen4R)

#Create manager to access your Zenodo repository
zenodo <- ZenodoManager$new(
  token = "your_token",
  sandbox = TRUE,
  logger = "INFO"
)

#Create a new empty record
myrec <- ZenodoRecord$new()
```

If you want to connect to Zenodo and not the Zenodo sandbox, create the token in your Zenodo account and remove the `sandbox = True` line in the code above.

The types of metadata that can be included in a Zenodo record are vast. A full list can be found in the documentation at <https://developers.zenodo.org/#representation>. The code below gives some examples.

```
myrec$setTitle("zen4R") #title of the record
myrec$addAdditionalTitle("This is an alternative title", type = "alternative-title")
myrec$setDescription("Interface to 'Zenodo' REST API") #description
myrec$addAdditionalDescription("This is an abstract", type = "abstract")
myrec$setPublicationDate("2024-09-16") #Format YYYY-MM-DD
myrec$setResourceType("dataset")
myrec$addCreator(firstname = "Yourfirstname", lastname = "Yourlastname", role = "datamanager")
myrec$setKeywords(c("R", "dataset")) #For filtering
myrec$addReference("Blondel E. et al., 2024 zen4R: R Interface to Zenodo REST API")
myrec$setPublisher("CRAN") #Publisher
```

A record can be deposited on Zenodo before it is published. This will add the record to your account without making it public yet. A deposited record can still be edited or deleted. You can also upload data to a deposited record. If you prefer a graphical interface, you can also edit the record on the Zenodo website.

```
#deposit record
myrec <- zenodo$depositRecord(myrec, publish = TRUE)

#add data to the record, adjust the path below
zenodo$uploadFile("path/to/your/file", record = myrec)
```

```
#delete record if you want to start over
zenodo$deleteRecord(myrec$id)
```

Once you are satisfied with the record, you can proceed with its publication.

```
#publish record
myrec <- zenodo$publishRecord(myrec$id)
```

Step 3: Edit a published Zenodo record

It is also possible to edit or update the metadata of published records.

```
#get your record by metadata query, e.g. by title
myrec <- zenodo$getDepositions(q='title:zen4R')

#get depositions creates a list, access first element
myrec <- myrec[[1]]

#edit metadata
myrec <- zenodo$editRecord(myrec$id)
myrec$setTitle("zen4R 2.0")

#redeposit and publish the edited record
myrec <- zenodo$depositRecord(myrec, publish = TRUE)
```

Once a record has been published, it is not possible to edit the data that has been attached to it. However, it is possible to upload an updated version of the data. The previous version of the data will remain accessible via Zenodo. The record will have one overall DOI, while each version will have its own DOI.

```
# reconnect to your account if necessary
zenodo <- ZenodoManager$new(
  token = "your_token",
  sandbox = TRUE,
  logger = "INFO"
)

#get your record by querying the metadata, e.g. by title, this will give you a list of all records
myrec <- zenodo$getDepositions(q='title:zen4R 2.0')
```

```
#access the first item in the list, as there should only be one record with that particular t
myrec <- myrec[[1]]

#edit data, delete_latest_files = TRUE deletes data of previous version,
myrec <- zenodo$depositRecordVersion(myrec, delete_latest_files = TRUE, files = "path/to/you
```

Step 9: Install zen4R to access Zenodo through r

Now that the project is set up and organized, it's time to share it with the wider research community on Zenodo. The following steps are heavily based on [1]. We have extracted the most relevant parts to explain the workflow. If you are interested in more details, check out their user manual at: <https://cran.r-project.org/web/packages/zen4R/vignettes/zen4R.html>.

For this exercise we will not be using Zenodo directly but Zenodo Sandbox. The Zenodo Sandbox is a separate, secure testing environment where users can explore Zenodo's features without impacting the main platform's publicly accessible data. It allows you to test file uploads, generate test DOIs, and experiment with API integrations. DOIs created in the sandbox are only for testing and use a different prefix. You will need a separate account and access token for the sandbox, distinct from those used on Zenodo's main site. - Create an account on <https://sandbox.zenodo.org>.

Zenodo can be accessed with r library zen4R to upload, edit, publish and download data.

- Create a new R script outside of the project directory.
- Install zen4R library with the following code:

```
#install dependency "remotes"
install.packages("remotes")

#install zen4R
require("remotes")
install_github("eblondel/zen4R")
```

Step 10: Create a new Zenodo record

A Zenodo record includes metadata, data and a Digital Object Identifier (DOI) which is automatically generated by Zenodo for all uploads. But before you can add records to Zenodo, you need to get access to your account through R.

- Go to <https://sandbox.zenodo.org/account/settings/applications/>.
- Log into your account and then create a new “Personal access token” in the “Applications” section of your account.

- Then run the following code in your script to establish the access and create a new record.

```
library(zen4R)

#Create manager to access your Zenodo repository
zenodo <- ZenodoManager$new(
  token = "your_token",
  sandbox = TRUE,
  logger = "INFO"
)

##Prepare a new record to be filled with metadata and uploaded to Zenodo
myrec <- ZenodoRecord$new()
```

If you want to connect to Zenodo and not Zenodo Sandbox, create the token in your Zenodo account and remove the line `sandbox = True` in the code above.

The types of metadata that can be included in a Zenodo record are vast. A full list can be found in the documentation at <https://developers.zenodo.org/#representation>.

- Copy and run the example below to add metadata to your record.

```
myrec$setTitle("RiceFarm") #title of the record
myrec$addAdditionalTitle("This is an alternative title", type = "alternative-title")
myrec$setDescription("Calculating statistics of RiceFarm dataset") #description
myrec$addAdditionalDescription("This is an abstract", type = "abstract")
myrec$setPublicationDate("2024-09-16") #Format YYYY-MM-DD
myrec$setResourceType("dataset")
myrec$addCreator(firstname = "Yourfirstname", lastname = "Yourlastname", role = "datamanager")
myrec$setKeywords(c("R", "dataset")) #For filtering
myrec$addReference("Blondel E. et al., 2024 zen4R: R Interface to Zenodo REST API")
```

A record can be deposited on Zenodo before it is published. This will add the record to your account without making it public yet. A deposited record can still be edited or deleted. You can also upload data to a deposited record. If you prefer a graphical interface, you can also edit the record on the Zenodo website.

- Deposit the record on Zenodo:

```
#deposit record
myrec <- zenodo$depositRecord(myrec, publish = TRUE)
```

- View the deposited record at <https://sandbox.zenodo.org/me/uploads?q=&l=list&p=1&s=10&sort=newest>
- Compress your project directory to a .zip file.

- Upload the .zip file to your deposited record:

```
#add data to the record, adjust the path below
zenodo$uploadFile("path/to/your/file", record = myrec)
```

- Publish the record:

```
#make the record publicly available on Zenodo (Sandbox).
myrec <- zenodo$publishRecord(myrec$id)
```

Step 11: Edit a published Zenodo record

It is also possible to edit or update the metadata of published records.

- Reconnect to your account:

```
zenodo <- ZenodoManager$new(
  token = "your_token",
  sandbox = TRUE,
  logger = "INFO"
)
```

- Access your record:

```
#get your record by querying the metadata, e.g. by title, this will give you a list of a
myrec <- zenodo$getDepositions(q='title:RiceFarm')

#access the first item in the list, as there should only be one record with that particu
myrec <- myrec[[1]]
```

- Modify your record:

```
#modify the record's metadata
myrec <- zenodo$editRecord(myrec$id)
myrec$setTitle("RiceFarm Statistics")
```

- Publish your changes:

```
#redeposit and publish the edited record
myrec <- zenodo$depositRecord(myrec, publish = TRUE)
```

Once a record has been published, it is not possible to edit the data that has been attached to it. However, it is possible to upload an updated version of the data. The previous version of the data will remain accessible via Zenodo. The record will have one overall DOI, while each version will have its own DOI.

- Reconnect to your account:

```
zenodo <- ZenodoManager$new(
  token = "your_token",
  sandbox = TRUE,
  logger = "INFO"
)
```

- Access your record:

```
#get your record by querying the metadata, e.g. by title, this will give you a list of a
myrec <- zenodo$getDepositions(q='title:RiceFarm Statistics')

#access the first item in the list, as there should only be one record with that particu
myrec <- myrec[[1]]
```

- Rename your .zip file on your computer
- Upload the renamed .zip file:

```
#edit data, delete_latest_files = TRUE to not include data of previous version in newer
myrec <- zenodo$depositRecordVersion(myrec, delete_latest_files = TRUE, files = "path/to/your/zip/file.zip")
```

- Again, go to <https://sandbox.zenodo.org/me/uploads?q=&l=list&p=1&s=10&sort=newest>
- Activate “View all versions” on the left hand side.
- Check if both versions show up

1. Blondel E, Barde J (2024) [zen4R: R Interface to Zenodo REST API](#)