# Data Simulation

This section describes the steps to simulate occurrence data for fitting spatially explicit occupancy models in R-INLA.

## Set up

```
# Load the libraries
library(INLA)
library(inlabru)
library(fmesher)
library(spatstat)
library(sf)
library(terra)
library(ggplot2)
library(tidyverse)
library(gt)
library(dplyr)
library(viridis)
library(viridisLite)
library(scico)
library(patchwork)
```

Define the spatial domain and the regular lattice by setting a $300 \times 300$ study area divided into $5 \times 5$ grid cells.

```
# Define spatial domain
win <- owin(c(0,300), c(0,300))
npix <- 1000

Domain <- rast(nrows=npix, ncols=npix,
               xmax=win$xrange[2],xmin=win$xrange[1],
```

```
                      ymax = win$yrange[2],ymin=win$yrange[1])

values(Domain) <- 1:ncell(Domain)
xy <- crds(Domain)

# Define regular grid
cell_size = 3
customGrid <- st_make_grid(Domain,cellsize = c(cell_size,cell_size)) %>%
  st_cast("MULTIPOLYGON") %>%
  st_sf() %>%
  mutate(cellid = row_number())

# number of cells
ncells <- nrow(customGrid)
```
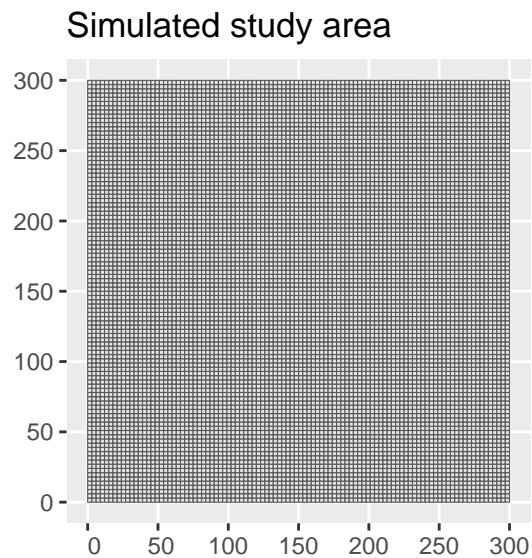


Figure 1: Custom $5^2$ units regular grid over a $300^2$ area .