Counterfactuals: Fixed storm surge, landslide and building typologies

```
# clear the working space
rm(list = ls())

library(here)
library(stats) # need this to calculate Mahalanobis Distance
library(parallel) # parallelize
library(dplyr)
library(FNN)
library(cluster)
library(ggplot2)
library(rpart)
library(caret)
```

Counterfactual Data Input

```
# Loading the counterfactuals
low_melor_2015 <- read.csv(here("data", "low_melor15_CF_data.csv"))

high_melor_2015 <- read.csv(here("data", "high_melor15_CF_data.csv"))
```

Import trained models

```
# Read the .rds models
base_reg <- readRDS(here("associational XGBOOST", "damage_fit_reg_base.rds"))
trunc_reg <- readRDS(here("associational XGBOOST", "trunc_damage_fit_reg.rds"))
clas_model  <- readRDS(here("associational XGBOOST", "ass_XGBOOST_class.rds"))
```

Counterfactual predictions

```
source(here("R", "ass_hurdle_function.R"))

# setting threshold for classification step
threshold = 0.30

low_preds <- ass_hurdle_function(df = low_melor_2015, ass_clas_model = clas_model,
  ass_base_model = base_reg, ass_trunc_model = trunc_reg ,threshold = threshold)
```

```r
high_preds <- ass_hurdle_function(df = high_melor_2015, ass_clas_model = clas_model,
  ass_base_model = base_reg, ass_trunc_model = trunc_reg ,threshold = threshold)
```

```r
# append the results to the counterfactual dataset
low_melor_2015  <- low_melor_2015 %>%
    mutate(damage_preds = low_preds)

high_melor_2015 <- high_melor_2015 %>%
    mutate(damage_preds = high_preds)
```

Low vulnerability

```r
# Get the first row for each level of C
low_first_rows <- low_melor_2015 %>%
  group_by(island_groups) %>%
  slice(1) %>%
  ungroup()

# Print the values from column B labeled with the level from C
for (i in 1:nrow(low_first_rows)) {
  cat(paste(low_first_rows$island_groups[i], ":", low_first_rows$damage_preds[i], "\n"))
}
```

```
## Luzon : 14.2906341552734
## Mindanao : 14.2906341552734
## Visayas : 14.2906341552734
```

High vulnerability

```r
# Get the first row for each level of C
high_first_rows <- high_melor_2015 %>%
  group_by(island_groups) %>%
  slice(1) %>%
  ungroup()

# Print the values from column B labeled with the level from C
for (i in 1:nrow(high_first_rows)) {
  cat(paste(high_first_rows$island_groups[i], ":", high_first_rows$damage_preds[i], "\n"))
}
```

```
## Luzon : 42.1007614135742
## Mindanao : 42.1007614135742
## Visayas : 42.1007614135742
```