R code used in PUBLIC SPACES ROSA 2020

**PACKAGES**

library(tidyverse)

#install.packages("ggthemes")

#library(ggthemes)

#install.packages("extrafont")

library(extrafont)

font\_import()

fonts()

loadfonts(device = "win") #this may work without extrafonts

#install.packages("ggpubr")

#install.packages("ggsci")

library(ggsci)

#library(ggpubr)

library(scales)

#install.packages("ggwordcloud")

#library(ggwordcloud)

install.packages("ggh4x")

library(ggh4x)

install.packages("viridis")

library("viridis")

install.packages("RColorBrewer")

library(RColorBrewer)

**DATA**

#load data

mydata8 <- read.csv("datarosa194csv.csv", header = TRUE)

dim(mydata8)

view(mydata8)

#Trim white space in all columns in loop? YES YES

for (i in 1:ncol(mydata8)){

mydata8[,i] <- trimws(mydata8[ ,i])

}

## create dataframe for Functionality, long

data\_funct8 <- data.frame(x = mydata8$COUNTRY,

y = c(mydata8$F1, mydata8$F2, mydata8$F3,mydata8$F4, mydata8$F5, mydata8$NF1, mydata8$NF2),

group = c(rep("F1", nrow(mydata8)),

rep("F2", nrow(mydata8)),

rep("F3", nrow(mydata8)),

rep("F4", nrow(mydata8)),

rep("F5", nrow(mydata8)),

rep("NF1", nrow(mydata8)),

rep("NF2", nrow(mydata8))))

dim(data\_funct8)

head(data\_funct8)

#convert the columns of data\_funct to factors

data\_funct8$x <- as.factor(data\_funct8$x)

data\_funct8$y <- as.factor(data\_funct8$y)

data\_funct8$group <- as.factor(data\_funct8$group)

class(data\_funct8$y)

#df for plot

df\_funct8 <- data.frame(COUNTRY = data\_funct8$x, FUNCT = data\_funct8$y, CODE = data\_funct8$group)

dim(df\_funct8)

head(df\_funct8)

#change levels of factors FUNCT column

df\_funct8$FUNCT <- fct\_relevel(df\_funct8$FUNCT, "Very common", after = 0)

df\_funct8$FUNCT <- fct\_relevel(df\_funct8$FUNCT, "Common", after = 1)

df\_funct8$FUNCT <- fct\_relevel(df\_funct8$FUNCT, "Not common", after = 2)

df\_funct8$FUNCT <- fct\_relevel(df\_funct8$FUNCT, "Don't know", after = 3)

levels(df\_funct8$FUNCT)

#change levels of factors CODE column

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "NF2", after = 0)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "NF1", after = 1)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "F5", after = 2)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "F4", after = 3)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "F3", after = 4)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "F2", after = 5)

df\_funct8$CODE <- fct\_relevel(df\_funct8$CODE, "F1", after = 6)

levels(df\_funct8$CODE)

#recode OFFICE

mydata8$OFFICE2 <- ifelse(mydata8$OFFICE == "National", "National", "Subnational")

#relevel DATA\_VAL

mydata8$DATA\_AVAL <- as.factor(mydata8$DATA\_AVAL)

mydata8$DATA\_AVAL <- fct\_relevel(mydata8$DATA\_AVAL, "Yes, data is collected at scale", after = 0)

mydata8$DATA\_AVAL <- fct\_relevel(mydata8$DATA\_AVAL, "Yes, but data collection is piecemeal/fragmented", after = 1)

mydata8$DATA\_AVAL <- fct\_relevel(mydata8$DATA\_AVAL, "No", after = 2)

levels(mydata8$DATA\_AVAL)

#relevel INSIGHT\_GAPS

mydata8$INSIGHT\_GAPS <- as.factor(mydata8$INSIGHT\_GAPS)

mydata8$INSIGHT\_GAPS <- fct\_relevel(mydata8$INSIGHT\_GAPS, "Yes", after = 0)

mydata8$INSIGHT\_GAPS <- fct\_relevel(mydata8$INSIGHT\_GAPS, "Somewhat", after = 1)

mydata8$INSIGHT\_GAPS <- fct\_relevel(mydata8$INSIGHT\_GAPS, "No", after = 2)

mydata8$INSIGHT\_GAPS <- fct\_relevel(mydata8$INSIGHT\_GAPS, "I don't know", after = 3)

levels(mydata8$INSIGHT\_GAPS)

#relevel DIS\_GROUP

mydata8$DIS\_GROUPS <- as.factor(mydata8$DIS\_GROUPS)

mydata8$DIS\_GROUPS <- fct\_relevel(mydata8$DIS\_GROUPS, "Most facilities are easily accessible", after = 0)

mydata8$DIS\_GROUPS <- fct\_relevel(mydata8$DIS\_GROUPS, "Around half of facilities is easily accessible", after = 1)

mydata8$DIS\_GROUPS <- fct\_relevel(mydata8$DIS\_GROUPS, "Almost none of the facilities are easily accessible", after = 2)

mydata8$DIS\_GROUPS <- fct\_relevel(mydata8$DIS\_GROUPS, "Don't know", after = 3)

levels(mydata8$DIS\_GROUPS)

**SPACE PRIORITY**

data\_space8 <- data.frame(COUNTRY = mydata8$COUNTRY, SPACE = mydata8$SPACE\_PRIORITY)

view(data\_space8)

#separate

data\_space88 <- data\_space8 %>%

separate(SPACE, c("aa","ab","ac","ad","ae","af","ag","ah","ai","aj","ak","al"), sep = ";", remove = FALSE, convert = FALSE, "merge")

view(data\_space88)

#check last column for values = correct

data\_space88 %>%

group\_by(al) %>%

summarise(oc = n())

#trim white space at end of string

for (i in 1:ncol(data\_space88)){

data\_space88[,i] <- trimws(data\_space88[ ,i])

}

#convert blank to NA and " " to NA

data\_space88[data\_space88 == "" | data\_space88 == " "] <- NA

#make long pivot

data\_space88long <- pivot\_longer(data\_space88, starts\_with("a"))

view(data\_space88long)

dim(data\_space88long)

head(data\_space88long)

#recode , make "other" catagory

data\_space88long$value[data\_space88long$value == "At a central place in a small town/village" | data\_space88long$value == "Banks and offices" | data\_space88long$value == "Camp entry point" | data\_space88long$value == "Entry Points of Rohingya Camps" | data\_space88long$value == "Flu clinics" | data\_space88long$value == "In the entry point of some buildings / Housing societies" | data\_space88long$value == "in front of public service offices/ institutes.." | data\_space88long$value == "Post offices, Panchayat/ Government offices" | data\_space88long$value == "Such as office premises" | data\_space88long$value == "Cemetery grounds, local government offices, some work places" | data\_space88long$value == "The facilities could be installed in any places."] <- "Other"

data\_space88long$value[data\_space88long$value == "No"] <- "None"

#check

data\_space88long %>%

group\_by(value) %>%

summarise(oc = n())

#as factor

data\_space88long$value <- as.factor(data\_space88long$value)

data\_space88long$COUNTRY <- as.factor(data\_space88long$COUNTRY)

class(data\_space88long$value)

#first make data frame for chart

df\_spaces8 <- data.frame(COUNTRY = data\_space88long$COUNTRY,

VALUE = data\_space88long$value)

#check

dim(df\_spaces8)

view(df\_spaces8)

class(df\_spaces8$COUNTRY)

class(df\_spaces8$VALUE)

#double check whitespaces remove

for (i in 1:ncol(df\_spaces8)){

df\_spaces8[,i] <- trimws(df\_spaces8[ ,i])

}

df\_spaces8$VALUE <- trimws(df\_spaces8$VALUE, which = c("both", "left", "right"), whitespace = "[\\h\\v]")

#recode the long answers

df\_spaces8$VALUE <- as.factor(df\_spaces8$VALUE)

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of commercial malls"] <- "Malls"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of places of worship"] <- "P.Worship"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of public institutions, such as townhalls"] <- "Townhalls"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of public toilets or bathing areas"] <- "Public toilets"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of schools"] <- "Schools"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of traditional markets"] <- "Markets"

levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of transport hubs (train or bus stations)"] <- "Transport Hubs"

#didn't work: levels(df\_spaces8$VALUE)[levels(df\_spaces8$VALUE) == "The entrance of health care facilities "] <- "HCF"

#i had a problem with recoding HCF, finally used the number of the factor to recode the string

levels(df\_spaces8$VALUE)

levels(df\_spaces8$VALUE)[11] <- "HCF"

levels(df\_spaces8$VALUE)[7] <- "Public toilets"

#rename all levels !!!! levels(x) <- c("one","two","three")

#check

df\_spaces8 %>%

group\_by(VALUE) %>%

summarise(oc = n())

#drop NA

df\_spaces88<- df\_spaces8 %>%

drop\_na(VALUE)

dim(df\_spaces88)

view(df\_spaces88)

#check

bb <- df\_spaces88 %>%

group\_by(VALUE)%>%

summarise(oc = n())

#relevel factors in df\_spaces88

levels(df\_spaces88$VALUE) #check

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "HCF", after = 0)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Schools", after = 1)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Malls", after = 2)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "P.Worship", after = 3)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Townhalls", after = 4)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Transport Hubs", after = 5)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Markets", after = 6)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Public toilets", after = 7)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "Other", after = 8)

df\_spaces88$VALUE <- fct\_relevel(df\_spaces88$VALUE, "None", after = 9)

levels(df\_spaces88$VALUE)

**PLOTS 1**

#COUNTRY - Figure 1

p\_country8 <- mydata8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

ggplot(aes(x = COUNTRY, fill = COUNTRY)) +

geom\_bar(width = 0.6)+

scale\_fill\_simpsons()+

theme\_bw()+

coord\_flip()+

guides(fill = FALSE)

p\_country8

#Office - figure X

p\_office8 <- mydata8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

ggplot(aes(x = COUNTRY, fill = OFFICE2))+

geom\_bar(aes(y = (..count..)/sum(..count..)), position = 'fill', width = 0.6)+

scale\_fill\_simpsons() +

scale\_y\_continuous(labels=percent) +

coord\_flip()+

theme\_bw()

p\_office8

#DATA\_VAL - Figure 2

p\_data8 <- mydata8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

ggplot(aes(x = COUNTRY, fill = DATA\_AVAL))+

geom\_bar(aes(y = (..count..)/sum(..count..)), position = 'fill')+

scale\_fill\_simpsons() +

scale\_y\_continuous(labels=percent) +

coord\_flip()+

theme\_bw()

p\_data8

#INSIGHT\_GAPS - Figure 3

p\_insight8 <- mydata8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(INSIGHT\_GAPS != "I don't know") %>%

ggplot(aes(x = COUNTRY, fill = INSIGHT\_GAPS))+

geom\_bar(aes(y = (..count..)/sum(..count..)), position = 'fill')+

scale\_fill\_simpsons() +

scale\_y\_continuous(labels=percent) +

coord\_flip()+

theme\_bw()

p\_insight8

#AGENT - Figure 4

p\_agent8 <- df\_agent8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(AGENT != "Other") %>%

filter(AGENT != "I don't know") %>% #used two lines becaus of strange error

group\_by(COUNTRY, AGENT) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=AGENT, y = per, fill = AGENT)) +

geom\_col(width = 0.8)+

scale\_fill\_simpsons()+

theme\_bw() +

scale\_y\_continuous(labels=percent, limits=c(0, 0.5), minor\_breaks = NULL, breaks=c(0,0.25))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_agent8

#space priority - Figure 5

p\_sppri8 <- df\_spaces88 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(VALUE != "I don't know") %>%

filter(VALUE != "None") %>%

group\_by(COUNTRY, VALUE) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=VALUE, y = per, fill = VALUE)) +

geom\_col()+

scale\_fill\_npg()+

theme\_bw() +

scale\_y\_continuous(labels=percent, limits=c(0, 0.27), minor\_breaks = NULL, breaks=c(0,0.15))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_sppri8

#space challenge - Figure 6

p\_spchal8 <- df\_spchal8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(SPACE\_CHAL != "None") %>%

filter(SPACE\_CHAL != "I don't know") %>%

group\_by(COUNTRY, SPACE\_CHAL) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=SPACE\_CHAL, y = per, fill = SPACE\_CHAL)) +

geom\_col()+

scale\_fill\_npg()+

theme\_bw()+

scale\_y\_continuous(labels=percent, limits=c(0, 0.22), minor\_breaks = NULL, breaks=c(0,0.15))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_spchal8

#Space assign responability - Figure 7

p\_spass8 <- df\_spass8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(SPACE\_ASSIGN != "I don't know") %>%

filter(SPACE\_ASSIGN != "Nowhere") %>%

group\_by(COUNTRY, SPACE\_ASSIGN) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=SPACE\_ASSIGN, y = per, fill = SPACE\_ASSIGN)) +

geom\_col()+

scale\_fill\_npg()+

theme\_bw()+

scale\_y\_continuous(labels=percent, limits=c(0, 0.3), minor\_breaks = NULL, breaks=c(0,0.15))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_spass8

#Disgroups - Figure 8

p\_disgroups8 <- mydata8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(DIS\_GROUPS != "Don't know") %>%

ggplot(aes(x = COUNTRY, fill = DIS\_GROUPS))+

geom\_bar(aes(y = (..count..)/sum(..count..)), position = 'fill')+

scale\_fill\_simpsons()+

scale\_y\_continuous(labels=percent) +

coord\_flip()+

theme\_bw() +

guides(fill = guide\_legend(reverse=TRUE))

p\_disgroups8

#functionality - Figure 9

p\_funct8 <- df\_funct8 %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(FUNCT != "Don't know") %>%

group\_by(COUNTRY,CODE,FUNCT) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x = CODE, y = per, fill = FUNCT))+

geom\_col()+

scale\_fill\_uchicago()+

theme\_bw()+

scale\_y\_continuous(labels=percent, limits=c(0, 1), minor\_breaks = NULL, breaks=c(0, 0.50))+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

#facet\_wrap(COUNTRY~.)

p\_funct8

#Issues, text anwsers, figure 10

p\_issues8 <- data\_issues8 %>%

ggplot(aes(x = reorder(IS, -PER), y = PER))+

geom\_col()+

scale\_fill\_simpsons()+

scale\_y\_continuous() +

coord\_flip()+

theme\_bw() +

guides(fill = guide\_legend(reverse=TRUE))

p\_issues8

**PLOTS 2**

#NEW Space assign responsability - Figure 7

p\_spassXX <- df\_spassXX %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(SPACE\_ASSIGN != "I don't know") %>%

filter(SPACE\_ASSIGN != "Nowhere") %>%

group\_by(COUNTRY, SPACE\_ASSIGN) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=SPACE\_ASSIGN, y = per, fill = SPACE\_ASSIGN)) +

geom\_col()+

scale\_fill\_npg()+

theme\_bw()+

scale\_y\_continuous(labels=percent, limits=c(0, 0.3), minor\_breaks = NULL, breaks=c(0,0.15))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_spassXX

#space challenge - Figure 6

p\_spchalXX <- df\_spchalXX %>%

filter(COUNTRY == "India" | COUNTRY == "Pakistan" | COUNTRY == "Afghanistan" | COUNTRY == "Bhutan" | COUNTRY == "Bangladesh" | COUNTRY == "Nepal") %>%

filter(SPACE\_CHAL != "None") %>%

filter(SPACE\_CHAL != "I don't know") %>%

filter(SPACE\_CHAL != "Refugee camp") %>% #refugee camp = "other"

group\_by(COUNTRY, SPACE\_CHAL) %>%

summarise(oc = n()) %>%

mutate(per = oc/sum(oc)) %>%

ggplot(aes(x=SPACE\_CHAL, y = per, fill = SPACE\_CHAL)) +

geom\_col()+

scale\_fill\_npg()+

theme\_bw()+

scale\_y\_continuous(labels=percent, limits=c(0, 0.22), minor\_breaks = NULL, breaks=c(0,0.15))+

guides(fill = FALSE)+

coord\_flip()+

facet\_grid(cols = vars(COUNTRY))

p\_spchalXX

#Issues, text anwsers, figure 10

p\_issuesXX <- data\_issues8 %>%

ggplot(aes(x = reorder(IS, -PER), y = PER, fill = IS))+

geom\_col()+

scale\_fill\_npg()+

coord\_flip()+

theme\_bw() +

guides(fill = guide\_legend(reverse=TRUE))

p\_issuesXX

**LABS**

figure1 <- p\_country8 + labs(title = "",

subtitle = "Number of responses by country",

x = "",

y = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"))+

force\_panelsizes(rows = unit(5, "cm"),

cols = unit(15, "cm"))

figure1

figureX <- p\_office8 + labs(title = "",

subtitle = "Scale of observations",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"),

legend.position = "bottom",

legend.key.height = unit(0.2, "cm")) +

force\_panelsizes(rows = unit(5, "cm"),

cols = unit(15, "cm"))

figureX

figure2 <- p\_data8 + labs(title = "",

subtitle = "Monitoring in public spaces",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"),

legend.position = "bottom",

legend.direction = "vertical",

legend.key.height = unit(0.2, "cm"),

legend.margin = margin(-10,0,0,0),

legend.box.margin=margin(-10,-10,-10,-10))+

force\_panelsizes(rows = unit(5, "cm"),

cols = unit(15, "cm"))+

guides(fill = guide\_legend(reverse=TRUE))

figure2

figure3 <- p\_insight8 + labs(title = "",

subtitle = "Knowledge of the gaps",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"),

legend.position = "bottom",

legend.direction = "vertical",

legend.key.height = unit(0.2, "cm"),

legend.margin = margin(-10,0,0,0),

legend.box.margin=margin(-10,-10,-10,-10))+

force\_panelsizes(rows = unit(5, "cm"),

cols = unit(15, "cm"))+

guides(fill = guide\_legend(reverse=TRUE))

figure3

figure4 <- p\_agent8 + labs(title = "",

subtitle = "Cleansing agents in public spaces",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"))+

guides(fill = FALSE)+

force\_panelsizes(rows = unit(4, "cm"))

# cols = unit(1, "cm"))

figure4

figure5 <- p\_sppri8 + labs(title = "",

subtitle = "Public spaces which have been prioritized",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"))+

guides(fill = FALSE)+

force\_panelsizes(rows = unit(6, "cm"))

# cols = unit(1, "cm"))

figure5

figure6 <- p\_spchalXX + labs(title = "",

subtitle = "Public spaces where O+M is most challenging",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"))+

guides(fill = FALSE)+

force\_panelsizes(rows = unit(6, "cm"))

# cols = unit(1, "cm"))

figure6

figure7 <- p\_spassXX + labs(title = "",

subtitle = "Public spaces where O+M is clearly assigned",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"))+

guides(fill = FALSE)+

force\_panelsizes(rows = unit(6, "cm"))

#cols = unit(0.1, "cm"))

figure7

figure8 <- p\_disgroups8 + labs(title = "",

subtitle = "Accessibility for disadvantaged groups",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"),

legend.position = "bottom",

legend.direction = "vertical",

legend.margin = margin(-10,0,0,0),

legend.box.margin=margin(-10,-10,-10,-10),

legend.key.height = unit(0.2, "cm")) +

force\_panelsizes(rows = unit(4, "cm"),

cols = unit(15, "cm"))+

guides(fill = guide\_legend(reverse=TRUE))

#legend.position = c(0.0, 0.0),

figure8

figure9 <- p\_funct8 + labs(title = "",

subtitle = "Functionality of hand hygiene facilities",

x = "",

y = "",

fill = "")+

theme\_bw(base\_size = 12)+

theme(text = element\_text(family = "Verdana"),

legend.position = "bottom",

legend.direction = "horizontal",

legend.key.height = unit(0.2, "cm"),

legend.margin = margin(0,0,0,0),

legend.box.margin=margin(-10,-10,-10,-10))+

force\_panelsizes(rows = unit(6, "cm"))+

guides(fill = guide\_legend(reverse=TRUE))

figure9

figure10 <- p\_issuesXX + labs(title = "",

subtitle = "Causes of limited or non-functionality of HHFs",

x = "",

y = "%",

fill = "")+

theme\_bw(base\_size = 12)+

guides(fill = FALSE)+

theme(text = element\_text(family = "Verdana"))+

force\_panelsizes(rows = unit(6, "cm"),

cols = unit(15, "cm"))

#legend.position = c(0.0, 0.0),

figure10

**GGSAVE**

ggsave("figure1.png", figure1, width = 28, height = 18, units = "cm")

ggsave("figure2.png", figure2, width = 28, height = 18, units = "cm")

ggsave("figure3.png", figure3, width = 28, height = 18, units = "cm")

ggsave("figureX.png", figureX, width = 28, height = 18, units = "cm")

ggsave("figure4.png", figure4, width = 28, height = 18, units = "cm")

ggsave("figure5.png", figure5, width = 28, height = 18, units = "cm")

ggsave("figure6.png", figure6, width = 28, height = 18, units = "cm")

ggsave("figure7.png", figure7, width = 28, height = 18, units = "cm")

ggsave("figure8.png", figure8, width = 28, height = 18, units = "cm")

ggsave("figure9.png", figure9, width = 28, height = 18, units = "cm")

ggsave("figure10.png", figure10, width = 28, height = 18, units = "cm")