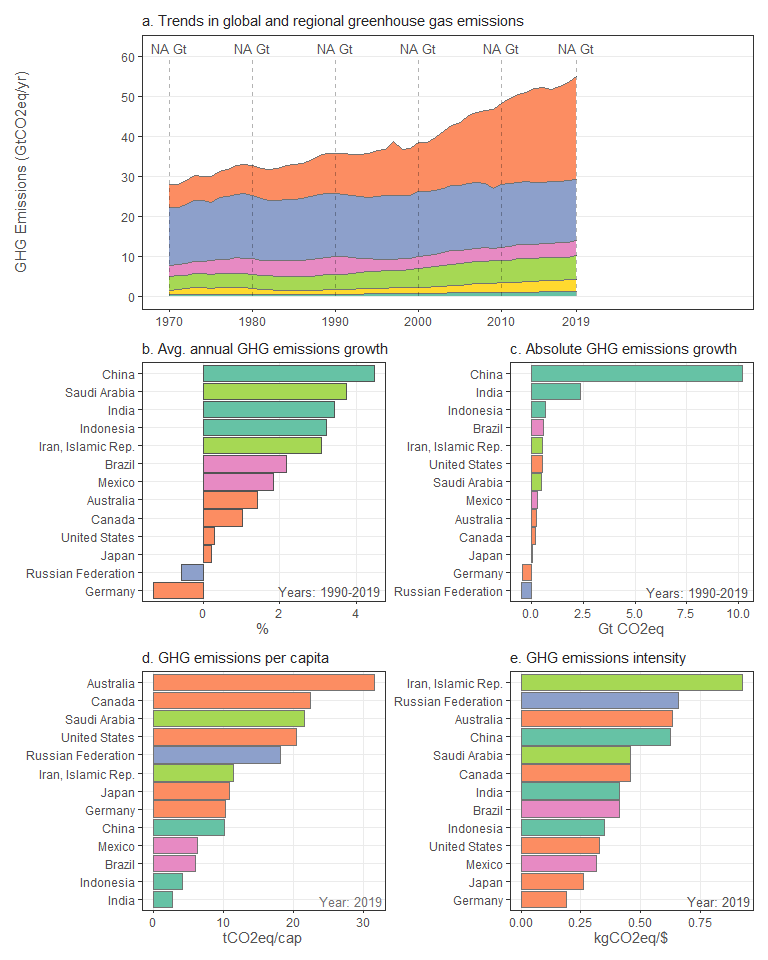
emissions\_by\_country

William F. Lamb

17 11 2020



#```{r per\_capita\_by\_region,echo=FALSE,warning=FALSE}

per\_capita <- edgar\_GHG\_ar6 %>% group\_by(country,ISO,year,region\_ar6\_5) %>% summarise(CO2=sum(CO2,na.rm=TRUE),GHG=sum(GHG,na.rm=TRUE)) %>% ungroup()

per\_capita <- left\_join(per\_capita,basic %>% select(Year,ISO,pop\_UN),by=c(“year”=“Year”,“ISO”=“ISO”))

per\_capita <- per\_capita %>% filter(year==2018) %>% mutate(CO2\_pc = CO2/pop\_UN) %>% mutate(GHG\_pc = GHG/pop\_UN)

all\_countries <- per\_capita

### remove intl. shipping, aviation and countries at zero emissions and small countries

per\_capita <- per\_capita %>% filter(region\_ar6\_5!=“Intl. Aviation”) %>% filter(region\_ar6\_5!=“Intl. Shipping”) %>% filter(CO2\_pc>0) %>% filter(pop\_UN>1e6)

per\_capita <- per\_capita %>% group\_by(region\_ar6\_5) %>% summarise(GHG\_pc\_max=max(GHG\_pc,na.rm=T),GHG\_pc\_min=min(GHG\_pc,na.rm=T))

region\_averages <- all\_countries %>% filter(region\_ar6\_5!=“Intl. Aviation”) %>% filter(region\_ar6\_5!=“Intl. Shipping”) %>% group\_by(region\_ar6\_5) %>% summarise\_at(vars(CO2,GHG,pop\_UN),sum,na.rm=TRUE)

per\_capita <- left\_join(per\_capita,region\_averages,by = “region\_ar6\_5”)

per\_capita <- per\_capita %>% mutate(GHG\_mean = GHG/pop\_UN) %>% mutate(CO2\_mean = CO2/pop\_UN)

#```{r cumulative\_emissions\_income,echo=FALSE,warning=FALSE}  
  
cumulative\_emissions\_income <- edgar\_GHG\_ar6 %>%   
 group\_by(country,ISO,year,region\_ar6\_dev) %>%   
 summarise(CO2=sum(CO2,na.rm=TRUE),GHG=sum(GHG,na.rm=TRUE)) %>%   
 ungroup()  
  
cumulative\_1990 <- cumulative\_emissions\_income %>%   
 filter(year>1989) %>%   
 group\_by(region\_ar6\_dev) %>%   
 summarise(GHG\_since\_1990=sum(GHG/1e9))  
  
cumulative\_2010 <- cumulative\_emissions\_income %>%   
 filter(year>2009) %>%   
 group\_by(region\_ar6\_dev) %>%   
 summarise(GHG\_since\_2010=sum(GHG/1e9))  
  
cumulative\_emissions\_income <- left\_join(cumulative\_1990,cumulative\_2010)  
  
total\_2010 <- sum(cumulative\_emissions\_income$GHG\_since\_2010)   
total\_1990 <- sum(cumulative\_emissions\_income$GHG\_since\_1990)  
  
cumulative\_emissions\_income <- cumulative\_emissions\_income %>%   
 mutate(fraction\_since\_1990=GHG\_since\_1990/total\_1990) %>%   
 mutate(fraction\_since\_2010=GHG\_since\_2010/total\_2010)

#```{r cumulative\_emissions\_geo,echo=FALSE,warning=FALSE}

cumulative\_emissions\_geo <- edgar\_GHG\_ar6 %>% group\_by(country,ISO,year,region\_ar6\_5) %>% summarise(CO2=sum(CO2,na.rm=TRUE),GHG=sum(GHG,na.rm=TRUE)) %>% ungroup()

cumulative\_1990 <- cumulative\_emissions\_geo %>% filter(year>1989) %>% group\_by(region\_ar6\_5) %>% summarise(GHG\_since\_1990=sum(GHG/1e9))

cumulative\_2010 <- cumulative\_emissions\_geo %>% filter(year>2009) %>% group\_by(region\_ar6\_5) %>% summarise(GHG\_since\_2010=sum(GHG/1e9))

cumulative\_emissions\_geo <- left\_join(cumulative\_1990,cumulative\_2010)

total\_2010 <- sum(cumulative\_emissions\_geoGHG\_since\_1990)

cumulative\_emissions\_geo <- cumulative\_emissions\_geo %>% mutate(fraction\_since\_1990=GHG\_since\_1990/total\_1990) %>% mutate(fraction\_since\_2010=GHG\_since\_2010/total\_2010)

#```{r region\_comparison,echo=FALSE,warning=FALSE}  
  
# blarg <- edgar\_GHG\_ar6 %>%  
# filter(year==2018) %>%   
# group\_by(region\_ar6\_dev) %>%   
# summarise(GHG=sum(GHG,na.rm=T)/1e9)  
#   
# blarg2 <- edgar\_GHG\_ar6 %>%  
# filter(year==2018) %>%   
# group\_by(region\_ar6\_5) %>%   
# summarise(GHG=sum(GHG,na.rm=T)/1e9)  
#   
#   
# regions <- edgar\_GHG\_ar6 %>%   
# filter(year==2018) %>%  
# group\_by(country,ISO,year,region\_ar6\_dev,region\_ar6\_5) %>%   
# summarise(GHG=sum(GHG,na.rm=T))  
#   
# regions <- left\_join(regions,basic %>% select(Year,ISO,pop\_UN),by=c("year"="Year","ISO"="ISO"))  
#   
#   
# regions <- regions %>%   
# filter(region\_ar6\_5=="Developed countries" | region\_ar6\_dev=="developed")

#```{r ridgeline\_plot,echo=FALSE,warning=FALSE,fig.width=9,fig.height=5}

load(‘../../Data/basic.RData’)

## get country level data

countries <- edgar\_GHG\_ar6 %>% filter(region\_ar6\_5\_short!=“AIR”) %>% filter(region\_ar6\_5\_short!=“SEA”) %>% group\_by(country,ISO,year,region\_ar6\_5\_short,region\_ar6\_10) %>% summarise(GHG=sum(GHG,na.rm=TRUE))

### join pop and gdp

basic <- basic %>%  
select(ISO,Year,pop\_UN)

countries <- left\_join(countries,basic,by=c(“ISO”=“ISO”,“year”=“Year”))

### select two time frames

countries\_tf1 <- countries %>% filter(year>=1990 & year<2000) %>% group\_by(country,ISO,region\_ar6\_5\_short,region\_ar6\_10) %>% summarise(GHG=sum(GHG)/10,pop\_UN=sum(pop\_UN)/10) %>% mutate(year=‘1990\_1999’)

countries\_tf2 <- countries %>% filter(year>=2010 & year<=2019) %>% group\_by(country,ISO,region\_ar6\_5\_short,region\_ar6\_10) %>% summarise(GHG=sum(GHG)/10,pop\_UN=sum(pop\_UN)/10) %>% mutate(year=‘2000\_2018’)

countries <- rbind(countries\_tf1,countries\_tf2)

countries <- countries %>% mutate(emissions\_pc=GHG/pop\_UN)

library(ggridges)

countries %>% ggplot(.,aes(x=emissions\_pc,y=region\_ar6\_10,fill=year)) + geom\_density\_ridges() + xlim(-10,100)

countries %>% ggplot(.,aes(x=emissions\_pc,y=region\_ar6\_10,fill=year)) + geom\_boxplot() + xlim(-10,100)

#```{r save, echo=FALSE, warning=FALSE}  
  
#   
# openxlsx::addWorksheet(wb,"country\_emissions\_2018")  
# openxlsx::writeData(wb,"country\_emissions\_2018",all\_countries, colNames = T, rowNames = F)  
  
openxlsx::addWorksheet(wb,"region\_summary\_2018")  
openxlsx::writeData(wb,"region\_summary\_2018",per\_capita, colNames = T, rowNames = F)  
  
openxlsx::addWorksheet(wb,"cumulative\_GHG\_emissions\_income")  
openxlsx::writeData(wb,"cumulative\_GHG\_emissions\_income",cumulative\_emissions\_income, colNames = T, rowNames = F)  
  
openxlsx::addWorksheet(wb,"cumulative\_GHG\_emissions\_geo")  
openxlsx::writeData(wb,"cumulative\_GHG\_emissions\_geo",cumulative\_emissions\_geo, colNames = T, rowNames = F)  
  
# openxlsx::addWorksheet(wb,"region\_comparison")  
# openxlsx::writeData(wb,"region\_comparison",regions, colNames = T, rowNames = F)  
  
  
openxlsx::saveWorkbook(wb,paste0("../../Results/Data/ipcc\_ar6\_data\_regions\_countries",".xlsx"),overwrite=T)

#```{r old, echo=FALSE, warning=FALSE}

side figures - per capita and per gdp

# load(‘../Data/basic.RData’)

# load(‘../Data/tsu\_codes.RData’)

# basic <- basic %>%

# filter(Year>=1990 & Year<2019) %>%

# select(ISO,Year,pop\_UN,gdp\_ppp\_WB) %>%

# filter(ISO!=“WLD”)

# basic <- left\_join(basic,tsu\_codes %>% select(ISO,region\_ar6\_5))

# basic <- basic %>%

# group\_by(Year,region\_ar6\_5) %>%

# summarise\_at(vars(gdp\_ppp\_WB,pop\_UN),sum,na.rm=T)

# side\_plot\_data <- edgar\_GHG\_ar6 %>%

# filter(year>1989) %>%

# filter(year<2019) %>%

# filter(region\_ar6\_5!=“Intl. Aviation”) %>%

# filter(region\_ar6\_5!=“Intl. Shipping”) %>%

# group\_by(year,region\_ar6\_5,region\_ar6\_5\_short) %>%

# summarise\_at(vars(GHG),sum,na.rm=TRUE)

# side\_plot\_data <- left\_join(side\_plot\_data,basic,by=c(“year”=“Year”,“region\_ar6\_5”=“region\_ar6\_5”))

# side\_plot\_data <- side\_plot\_data %>%

# mutate(GHG\_pc = GHG/pop\_UN) %>%

# mutate(GHG\_pgdp = GHG/gdp\_ppp\_WB\*1000) %>%

# mutate(GHG\_pgdp = ifelse(year==2018,NA,GHG\_pgdp))

# p2\_1 <- side\_plot\_data %>%

# ggplot(.,aes(x=year,y=GHG\_pc,colour=region\_ar6\_5\_short)) +

# geom\_line() +

# theme\_bw() +

# ylab(‘GHG Emissions(tCO2eq/cap)’) +

# theme(legend.position = “none”,

# axis.title.x = element\_blank(),

# text = element\_text(size=11),

# panel.grid.minor.x = element\_blank(),

# panel.grid.minor.y = element\_blank())

# p2\_2 <- side\_plot\_data %>%

# ggplot(.,aes(x=year,y=GHG\_pgdp,colour=region\_ar6\_5\_short)) +

# geom\_line() +

# theme\_bw() +

# ylab(‘GHG Emissions intensity(gCO2eq/$)’) +

# theme(legend.position = “bottom”,

# axis.title.x = element\_blank(),

# text = element\_text(size=11),

# panel.grid.minor.x = element\_blank(),

# panel.grid.minor.y = element\_blank())

# p2 <- ggarrange(p2\_1,p2\_2,ncol=1,nrow=2)

```