A2.1: Refugee Status

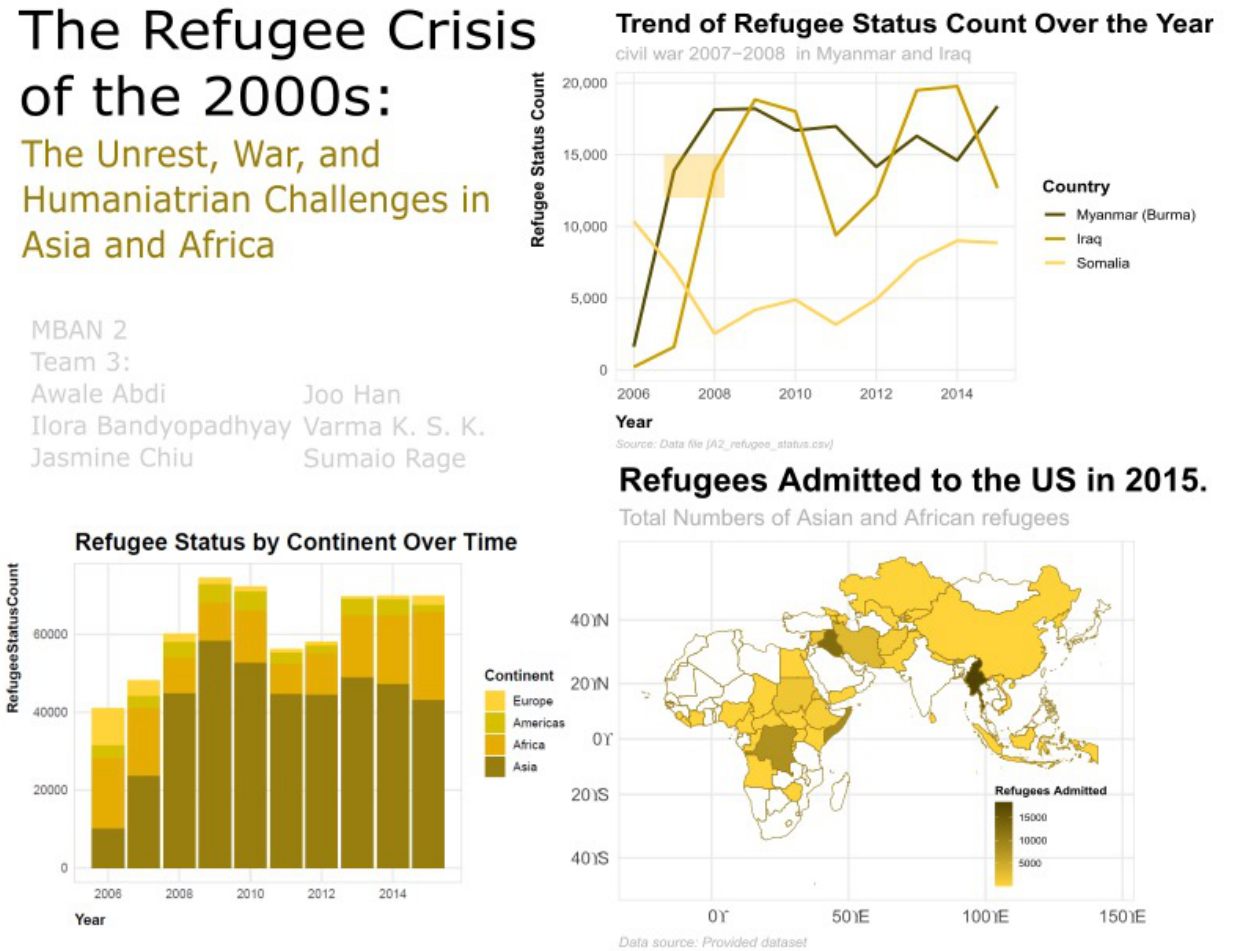
[redacted]

2024-02-24

Executive summary

The Refugee Crisis of the 2000s: The Unrest, War, and Humanitarian Challenges in Asia and Africa

```
knitr::include_graphics("data/Team3_MBAN2_A2.1.png")
```



The 21st century has a series of conflicts, political upheavals, and humanitarian crises that precipitated one of the most significant refugee crises of modern times. As the world is progressing with advancement in science

and technology at one end, there are parts of the world grappled with geopolitical shifts and internal strife, millions of individuals were displaced from their homes, forced to flee in search of safety and refuge. From the sprawling plains of Myanmar to the war-torn streets of Iraq and the famine-stricken lands of Somalia, the early 2000s bore witness to a convergence of crises that would test the resilience of nations and the global community alike.

The refugees migrating to US in the timeline 2006 to 2015 was observed and the highest numbers were observed in refugees from Iraq, Myanmar and Somalia. The unrest and challenges in parts of Asia and Africa make it challenging to lead a normal lifestyle, mainly due to political unrest and geopolitical issues, affecting gigantic number of refugees from Asia and Africa settling in US in refugee camps.

As we see the spike in the line chart in 2007, Myanmar had geopolitical issues and civil war in 2007 that led to the Saffron revolution, leading to hike in prices of oil and fuel. This time period showed political unrest, ethnic conflicts, and human rights abuses and thus, we see the high number of refugees moving out of Myanmar.

In 2006, the human rights situation worsened significantly in Iraq.The continuing armed conflict became increasingly sectarian in nature, with many commentators declaring the onset of a civil war, reflecting in the spike in 2007- 2008 number of Refugees from Iraq.After the 2003 US invasion and again during the heightened violence brought on by Islamic state terror attacks during this time period, millions of Iraqis were displaced. Engineers, lawyers, doctors and other professionals were among the first to escape the war. The war situation is the country caused worsening of the healthcare system and people moved out in flocks, leaving their homeland and residing in US as refugees.

The famine of 2011 in Somalia, followed by the civil war caused a great number of Somali refugees leave Somalia, as seen in the line chart.Number of Somali refugees increased in 2014, they all speak of the grim situation in the country, marked by relentless violence and human rights abuse. Somali refugees were forced to conscription by some of the warring parties and the crippling famine took away lives, forcing them to leave Somalia.

We see that in this advanced era, war and political crisis are negatively impacting human rights and forcing people to leave their homeland. Overcoming this ironical situation is a challenge to humanity today.

The Principles of CRAP

In designing the refugee trends visualizations, we meticulously applied the CRAP design principles to ensure an effective presentation of the data. For contrast, we chose distinctive colors and font styles to clearly differentiate between the data of each country, ensuring that each stood out for easy identification and comparison.Repetition was maintained throughout the design elements to create a cohesive look and feel, using the same color schemes and font styles across the different visualizations to aid in viewer recognition and retention. Alignment was carefully managed to give the visuals a clean and organized layout, with each element positioned in a way that created a clear, logical flow for the eye to follow. Lastly, proximity was employed to group related elements together, using strategic placement and visual cues to indicate related data points and annotations, thus facilitating an intuitive understanding of complex data relationships. These design principles collectively enhanced the clarity, cohesiveness, and interpretability of the visual data, making the information both compelling and accessible to the audience.

Kieran Healy's principles of great visualizations:

In applying Kieran Healy's principles of effective data visualization to analyze refugee status dataset, several crucial elements were considered to ensure clarity, comprehensibility, and relevance. Firstly, a line graph was chosen to depict refugee counts over time, aligning with the principle of selecting an appropriate graph type for the data's nature. This graph effectively displays changes and trends over time, facilitating comparison between the three countries.

Distinct colors were applied to each country's line within the graph, in accordance with the principle of using color effectively. This differentiation aids quick identification of each trend line, preventing confusion and enhancing intuitive comparison.

Additionally, an annotated event for Myanmar in 2007 and Iraq and 2008 was included within the visualization, aligning with Healy's encouragement to provide context directly within the visualization. This correlation of specific data points with historical events helps viewers understand the underlying story behind the trends observed.

Lastly, the visualization process aimed to strike a balance between complexity and simplicity, following Healy's principle. The visuals are sufficiently complex to convey depth of information, yet simple enough for a broad audience without specialized knowledge to understand. This equilibrium ensures that the visualizations effectively inform and engage audiences on the complex issue of refugee movements in response to crises.

```
# Load necessary libraries
library(dplyr)
library(tidyverse)
library(lubridate)
library(scales) #for nice labels in charts
library(countrycode)
library(plotly)
library(rnaturalearth)
library(sf)
library(ggplot2)



refugee <- read_csv("data/A2_refugee_status.csv")

refugee
```

```
## # A tibble: 70 x 11
##    Continent/Country of Natio~1 `2006` `2007` `2008` `2009` `2010` `2011` `2012`
##    <chr>                        <chr>  <chr>  <chr>  <chr>  <chr>  <chr>  <chr>
##  1 Africa                       18,129 17,486 8,943  9,678  13,325 7,693  10,629
##  2 Asia                         10,086 23,564 44,819 58,309 52,695 44,583 44,416
##  3 Europe                       9,615  4,192  2,059  1,693  1,238  996    908
##  4 North America                3,145  2,922  4,177  4,800  4,856  2,930  1,948
##  5 Oceania                      -      -      -      -      -      -      -
##  6 South America                119    54     100    57     126    46     130
##  7 Unknown                      -      -      9      65     1,053  136    148
##  8 Afghanistan                  651    441    576    349    515    428    481
##  9 Angola                       13     4      -      8      -      D      -
## 10 Armenia                      87     29     9      4      D      15     8
## # i 60 more rows
## # i abbreviated name: 1: `Continent/Country of Nationality`
## # i 3 more variables: `2013` <chr>, `2014` <chr>, `2015` <chr>
```

```
#Handling non-numeric values
refugee_data <- refugee %>%
  mutate(across(starts_with("2006"):starts_with("2015"),
                ~ifelse(!grepl("^-|X|D$", .), as.integer(gsub(",", "", .)), as.integer(NA))))

# Checking the changes
refugee_data
```

```
## # A tibble: 70 x 11
```

```
##    Continent/Country of Natio~1 `2006` `2007` `2008` `2009` `2010` `2011` `2012`
##    <chr>                          <int>  <int>  <int>  <int>  <int>  <int>  <int>
##  1 Africa                         18129  17486   8943   9678  13325   7693  10629
##  2 Asia                           10086  23564  44819  58309  52695  44583  44416
##  3 Europe                          9615   4192   2059   1693   1238    996    908
##  4 North America                   3145   2922   4177   4800   4856   2930   1948
##  5 Oceania                           NA     NA     NA     NA     NA     NA     NA
##  6 South America                    119     54    100     57    126     46    130
##  7 Unknown                           NA     NA      9     65   1053    136    148
##  8 Afghanistan                      651    441    576    349    515    428    481
##  9 Angola                            13      4     NA      8     NA     NA     NA
## 10 Armenia                           87     29      9      4     NA     15      8
## # i 60 more rows
## # i abbreviated name: 1: `Continent/Country of Nationality`
## # i 3 more variables: `2013` <int>, `2014` <int>, `2015` <int>
```

```
# List of country names to keep
countries_to_keep <- c("Afghanistan", "Angola", "Armenia", "Azerbaijan", "Belarus", "Bhutan", "Bosnia-H

# Filter to keep only specific countries
refugee_data_filtered <- refugee_data %>%
  filter(`Continent/Country of Nationality` %in% countries_to_keep)

# Checking the changes
refugee_data_filtered
```

```
## # A tibble: 60 x 11
##    Continent/Country of Natio~1 `2006` `2007` `2008` `2009` `2010` `2011` `2012`
##    <chr>                          <int>  <int>  <int>  <int>  <int>  <int>  <int>
##  1 Afghanistan                      651    441    576    349    515    428    481
##  2 Angola                            13      4     NA      8     NA     NA     NA
##  3 Armenia                           87     29      9      4     NA     15      8
##  4 Azerbaijan                        77     78     30     38     18     16     10
##  5 Belarus                          350    219    111    146    103     66     83
##  6 Bhutan                             3     NA   5320  13452  12363  14999  15070
##  7 Bosnia-Herzegovina                16     NA     NA     NA     NA     NA     NA
##  8 Burma                           1612  13896  18139  18202  16693  16972  14160
##  9 Burundi                          466   4545   2889    762    530    110    186
## 10 Cambodia                           9     15      8     15      9      5      6
## # i 50 more rows
## # i abbreviated name: 1: `Continent/Country of Nationality`
## # i 3 more variables: `2013` <int>, `2014` <int>, `2015` <int>
```

```
refugees_data_clean <- refugee_data_filtered %>%
  # Make this column name easier to work with
  rename(Countries = `Continent/Country of Nationality`) %>%

  # Convert country names to ISO3 codes
  mutate(iso3 = countrycode(Countries, "country.name", "iso3c",
                            custom_match = c("Korea, North" = "PRK"))) %>%
  # Convert ISO3 codes to country names, regions, and continents
  mutate(Countries = countrycode(iso3, "iso3c", "country.name"),
         Continent = countrycode(iso3, "iso3c", "continent"))
refugees_data_clean
```

```
## # A tibble: 60 x 13
##    Countries      `2006` `2007` `2008` `2009` `2010` `2011` `2012` `2013` `2014`
##    <chr>           <int>  <int>  <int>  <int>  <int>  <int>  <int>  <int>  <int>
##  1 Afghanistan       651    441    576    349    515    428    481    661    753
##  2 Angola             13      4     NA      8     NA     NA     NA      6     NA
##  3 Armenia            87     29      9      4     NA     15      8      3     10
##  4 Azerbaijan         77     78     30     38     18     16     10      3     15
##  5 Belarus           350    219    111    146    103     66     83     10     46
##  6 Bhutan              3     NA   5320  13452  12363  14999  15070   9134   8434
##  7 Bosnia & Herz~     16     NA     NA     NA     NA     NA     NA     NA     NA
##  8 Myanmar (Burm~   1612  13896  18139  18202  16693  16972  14160  16299  14598
##  9 Burundi           466   4545   2889    762    530    110    186    193     68
## 10 Cambodia            9     15      8     15      9      5      6     30     44
## # i 50 more rows
## # i 3 more variables: `2015` <int>, iso3 <chr>, Continent <chr>
```

```
refugee_tidy <-  refugees_data_clean %>%
  pivot_longer(cols = c(`2006`, `2007`, `2008`, `2009`, `2010`, `2011`, `2012`, `2013`, `2014`, `2015`)

refugee_tidy
```

```
## # A tibble: 600 x 5
##    Countries   iso3  Continent year  RefugeeStatusCount
##    <chr>       <chr> <chr>     <chr>              <int>
##  1 Afghanistan AFG   Asia      2006                 651
##  2 Afghanistan AFG   Asia      2007                 441
##  3 Afghanistan AFG   Asia      2008                 576
##  4 Afghanistan AFG   Asia      2009                 349
##  5 Afghanistan AFG   Asia      2010                 515
##  6 Afghanistan AFG   Asia      2011                 428
##  7 Afghanistan AFG   Asia      2012                 481
##  8 Afghanistan AFG   Asia      2013                 661
##  9 Afghanistan AFG   Asia      2014                 753
## 10 Afghanistan AFG   Asia      2015                 910
## # i 590 more rows
```

```
refugee_tidy <- refugee_tidy %>%
  mutate(year = as.integer(year),
         year_date = ymd(paste0(year, "-01-01")))
refugee_tidy
```

```
## # A tibble: 600 x 6
##    Countries   iso3  Continent  year RefugeeStatusCount year_date
##    <chr>       <chr> <chr>     <int>              <int> <date>
##  1 Afghanistan AFG   Asia       2006                651 2006-01-01
##  2 Afghanistan AFG   Asia       2007                441 2007-01-01
##  3 Afghanistan AFG   Asia       2008                576 2008-01-01
##  4 Afghanistan AFG   Asia       2009                349 2009-01-01
##  5 Afghanistan AFG   Asia       2010                515 2010-01-01
##  6 Afghanistan AFG   Asia       2011                428 2011-01-01
```

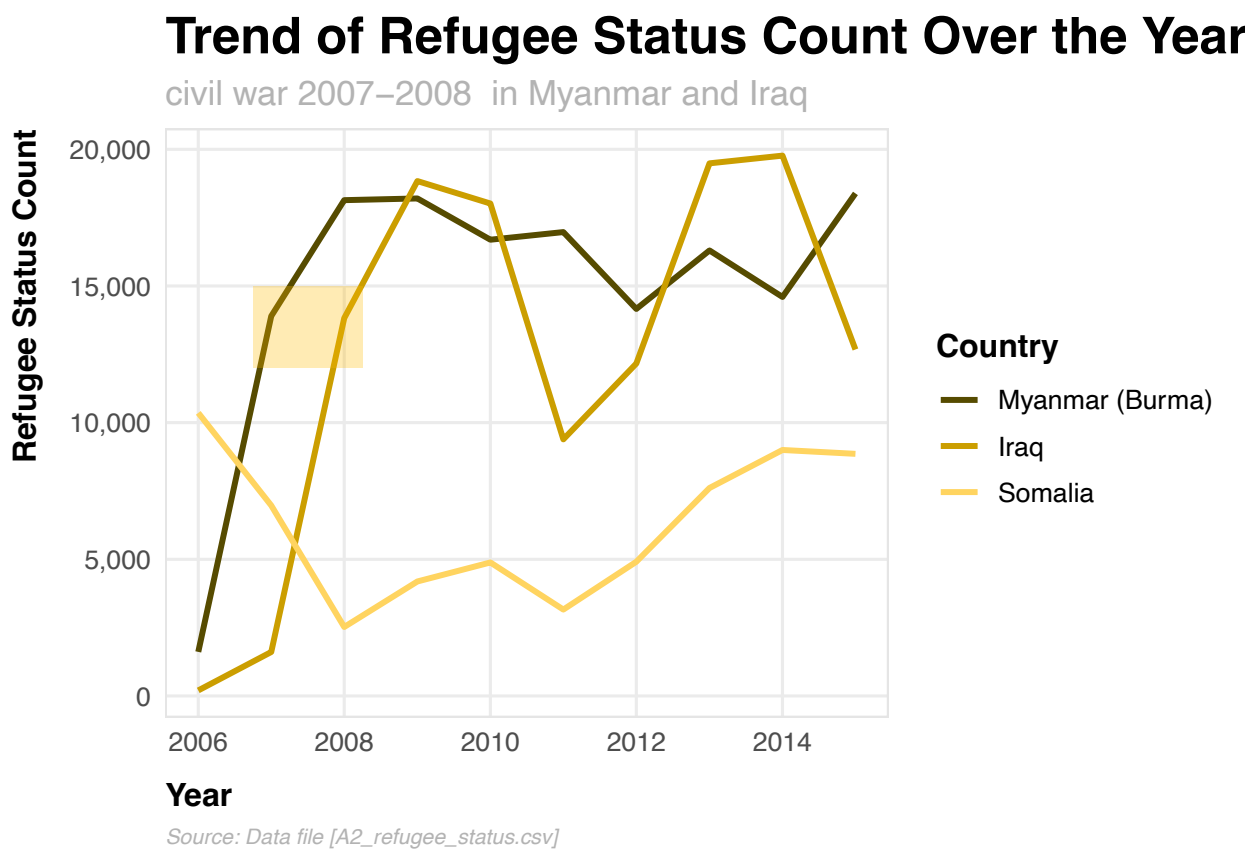
```
##  7 Afghanistan AFG   Asia       2012               481 2012-01-01
##  8 Afghanistan AFG   Asia       2013               661 2013-01-01
##  9 Afghanistan AFG   Asia       2014               753 2014-01-01
## 10 Afghanistan AFG   Asia       2015               910 2015-01-01
## # i 590 more rows
```

```r
top_10_countries <- refugee_tidy %>%
  group_by(Countries) %>%
  summarise(total_refugees = sum(RefugeeStatusCount)) %>%
  top_n(10, total_refugees) %>%
  arrange(desc(total_refugees))

top_10_countries
```

```
## # A tibble: 10 x 2
##    Countries        total_refugees
##    <chr>                     <int>
##  1 Myanmar (Burma)          148957
##  2 Iraq                     125969
##  3 Somalia                   62460
##  4 Iran                      34792
##  5 Cuba                      34522
##  6 Congo - Kinshasa          24108
##  7 Eritrea                   14179
##  8 Burundi                   10935
##  9 Sudan                     10633
## 10 Russia                     9930
```

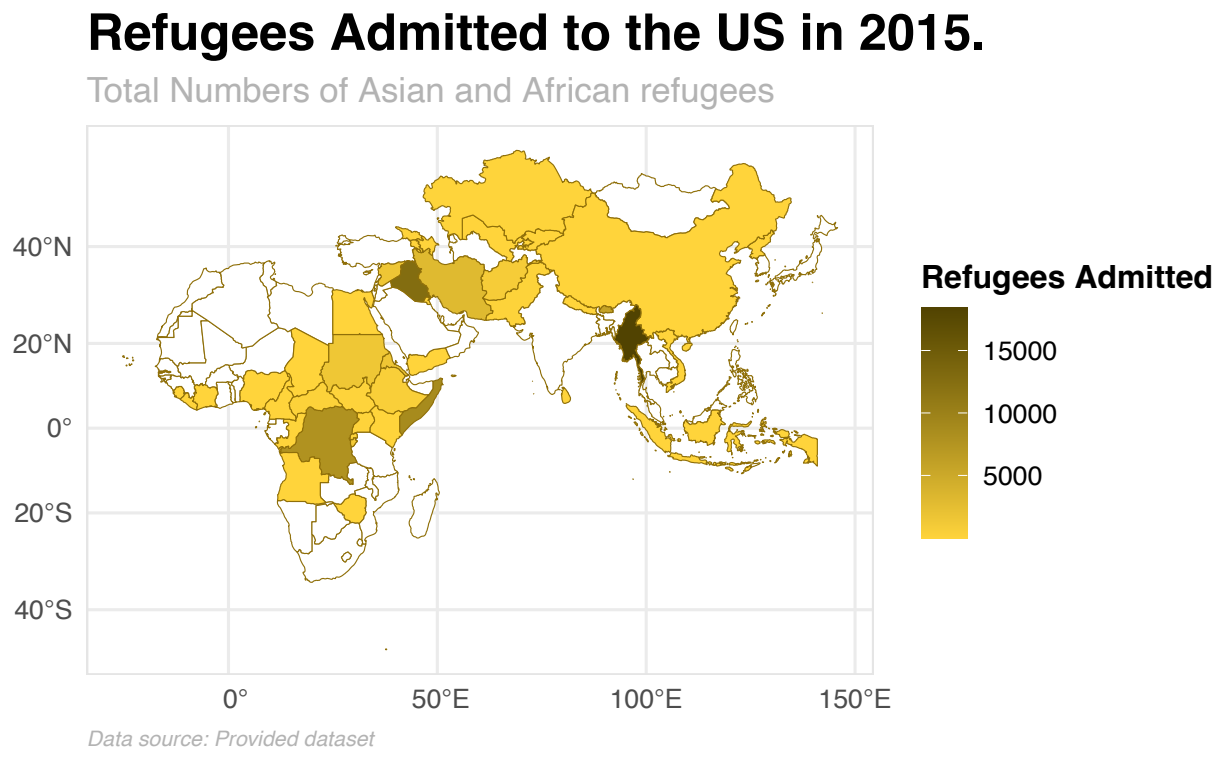
```r
my_pretty_theme <- theme_minimal(base_family = "Helvetica", base_size = 12) +
  theme(panel.grid.minor = element_blank(),
        # Bold, bigger title
        plot.title = element_text(face = "bold", size = rel(1.6)),
        # Plain, slightly bigger subtitle that is grey
        plot.subtitle = element_text(face = "plain", size = rel(1.1), color = "grey70"),
        # Italic, smaller, grey caption that is left-aligned
        plot.caption = element_text(face = "italic", size = rel(0.7),
                                    color = "grey70", hjust = 0),
        # Bold legend titles
        legend.title = element_text(face = "bold"),
        # Bold, slightly larger facet titles that are left-aligned for the sake of repetition
        strip.text = element_text(face = "bold", size = rel(1.2), hjust = 0),
        # Bold axis titles
        axis.title = element_text(face = "bold"),
        # Add some space above the x-axis title and make it left-aligned
        axis.title.x = element_text(margin = margin(t = 10), hjust = 0),
        # Add some space to the right of the y-axis title and make it top-aligned
        axis.title.y = element_text(margin = margin(r = 10), hjust = 1),
        # Add a light grey background to the facet titles, with no borders
        strip.background = element_rect(fill = "grey90", color = NA),
        # Add a thin grey border around all the plots to tie in the facet titles
        panel.border = element_rect(color = "grey90", fill = NA))
```

```r
Country_1 <- c("Myanmar (Burma)", "Iraq", "Somalia")

refugee_tidy_top_3 <- refugee_tidy %>%
  filter(Countries %in% Country_1)

# Define a custom color palette with dark orange shades
colors <- c("#564B00", "#CB9E00", "#FFD460")  # Dark orange variations for each country

base_plot <- ggplot(data = refugee_tidy_top_3,
                    mapping = aes(x = year_date, y = RefugeeStatusCount,
                                  color = factor(Countries, levels = Country_1))) +
  geom_line(size = 1.05) +  # Increase line thickness
  scale_y_continuous(labels = comma) +
  scale_color_manual(values = colors) +
  labs(x = "Year", y = "Refugee Status Count",
       color = "Country",
       title = "Trend of Refugee Status Count Over the Years",
       subtitle = "civil war 2007-2008  in Myanmar and Iraq",
       caption = "Source: Data file [A2_refugee_status.csv]") +
  annotate("rect", xmin = as.Date("2006-10-01"), xmax = as.Date("2008-04-01"),
           ymin = 12000, ymax = 15000, alpha = .3, fill = "#FFBB03") + # Dark orange color for the anno

  my_pretty_theme
base_plot
```



```r
# Save the plot
ggsave(base_plot, filename = "Refugee_status_by_Countries.png", width = 12, height = 10)
```

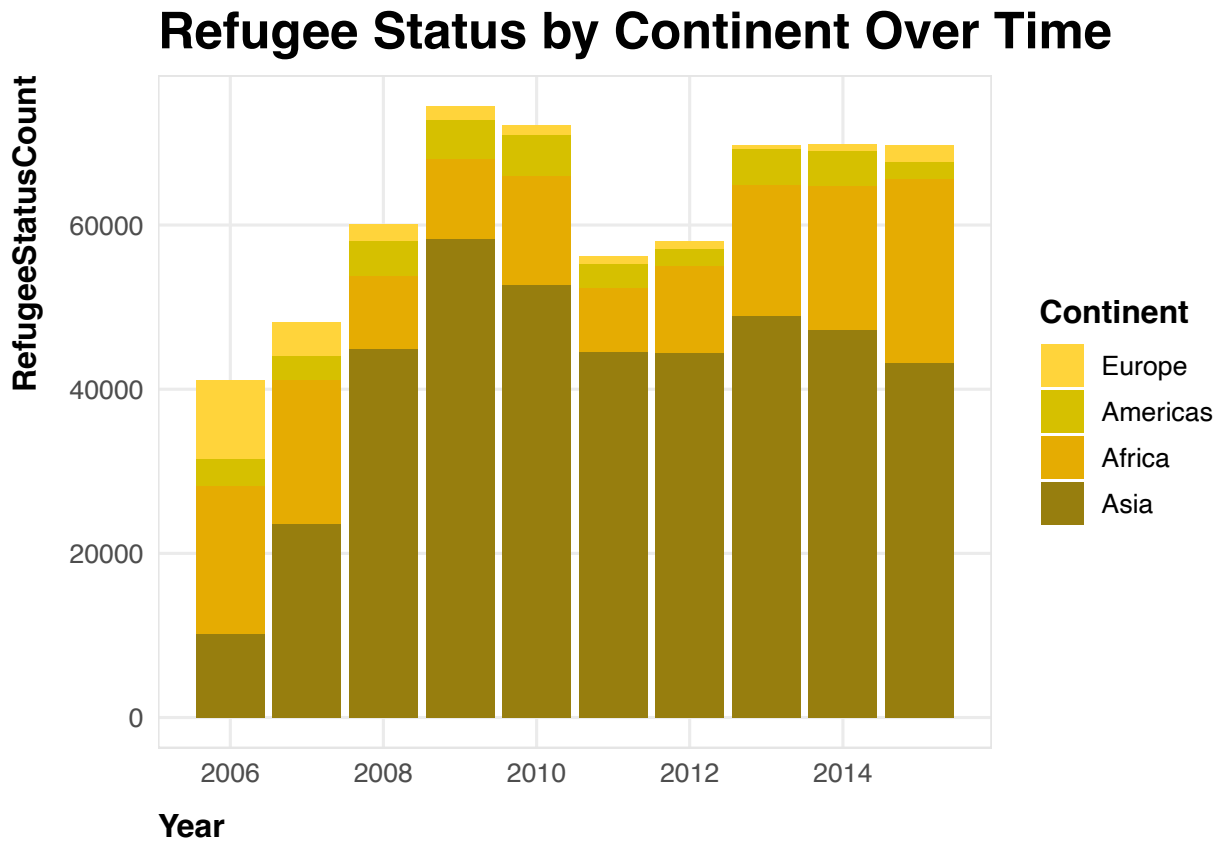
```r
# Filter the dataset for the year 2015
refugee_2015 <- refugee_tidy %>%
  filter(year == 2015)

# Load a world map with Mercator projection, then filter for Asia, Africa, and North America
world <- ne_countries(scale = "medium", returnclass = "sf") %>%
  st_transform(crs = 3395) %>%
  filter(continent %in% c("Asia", "Africa"))

# Merge the spatial data with the refugee data
world_with_refugees <- world %>%
  left_join(refugee_2015, by = c("iso_a3" = "iso3"))

# Plotting with a gradient of dark orange
p2 <- ggplot(data = world_with_refugees) +
  geom_sf(aes(fill = RefugeeStatusCount), color = "#8F6F09", size = 0.25) +
  scale_fill_gradient(low = "#FFD43B", high = "#514301",
                      na.value = "white", name = "Refugees Admitted") +
  coord_sf(crs = st_crs(3395)) +
  theme_void() +
  theme(text = element_text(size = 12)) +
  labs(title = "Refugees Admitted to the US in 2015.",
       subtitle = "Total Numbers of Asian and African refugees",
       caption = "Data source: Provided dataset")+

my_pretty_theme
p2
```




```
# Save the plot
ggsave(p2, filename = "Refugee_status_by_Map.png", width = 12, height = 10)
```

```
library(reshape2) # melt()
library(plyr)


# Melt the data to long format
refugee_long <- melt(refugee_tidy, id.vars = c("year_date", "Continent"),
                     measure.vars = "RefugeeStatusCount",
                     variable.name = "RefugeeStatus", value.name = "Count")

# Reorder the levels of the 'Continent' factor variable
refugee_long$Continent <- factor(refugee_long$Continent,
                                 levels = c("Europe", "Americas", "Africa", "Asia"))

# Plot
p <- ggplot(refugee_long, aes(x = year_date, y = Count, fill = Continent)) +
  geom_bar(stat = "identity") +
  scale_fill_manual(values = c("#FFD43B", "#D6C000","#E5AC02", "#977E0E")) +  #Continent for colors
  labs(x = "Year", y = "RefugeeStatusCount", fill = "Continent") +
  ggtitle("Refugee Status by Continent Over Time") +
  theme_bw() +
  theme(plot.title = element_text(size = rel(1.2), face = "bold"),
        legend.position = "bottom")+
```

```
my_pretty_theme

print(p)
```




```
# Save the plot
ggsave(p, filename = "Refugee_status_by_Continent.png", width = 10, height = 6)
```

References:

2007: Myanmar (Burma) political unrest causing Saffron Revolution https://rpl.hds.harvard.edu/faq/saffron-revolution#:~:text=The%20military%20government's%20decision%20to,traditional%20color%20of%20monks'%20rob

2008: Iraqi civil war between 2006 and 2008 https://www.cfr.org/timeline/iraq-war

2011: Somalia Civil war and famine https://www.hrw.org/report/2011/08/14/you-dont-know-who-blame/war-crimes-somalia https://www.unhcr.org/us/news/briefing-notes/number-somali-refugees-grows-sharply-2011