

# 615-Final

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## Introduction

Bahrain, an island nation located in the Arabian Gulf, holds a unique position as a thriving hub for finance, trade, and culture in the Middle East. Despite its small size, Bahrain boasts a rich history dating back millennia, serving as a crossroads of ancient trade routes. Today, its strategic location and modern infrastructure make it a vital economic center in the region. Known for its progressive approach to governance and a diversifying economy, Bahrain has emerged as a key player in sectors such as banking, tourism, and technology. This project explores various dimensions of Bahrain's identity, including its demographics, economy, and role within the Gulf region, while delving into its challenges and opportunities.

## Bahrain at a glimpse

### Map of Bahrain

```
library(sf)
```

Linking to GEOS 3.12.1, GDAL 3.8.4, PROJ 9.3.1; sf\_use\_s2() is TRUE

```
library(ggplot2)
```

```
bahrain <- st_read("https://raw.githubusercontent.com/akalati/bahrain-geojson/main/areas.json")
```

Reading layer `areas' from data source

`https://raw.githubusercontent.com/akalati/bahrain-geojson/main/areas.json'

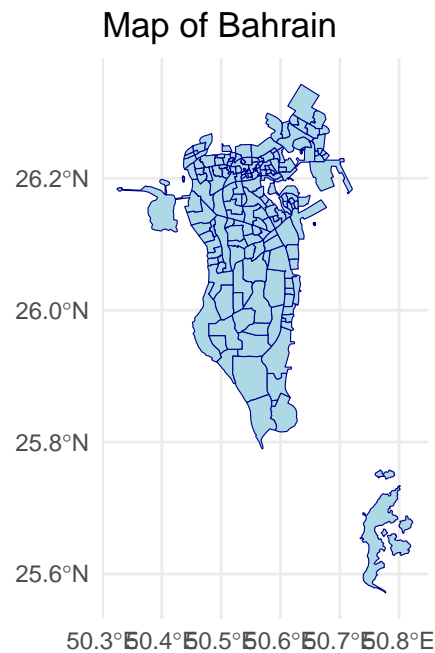
using driver `GeoJSON'

Simple feature collection with 187 features and 6 fields

Geometry type: POLYGON

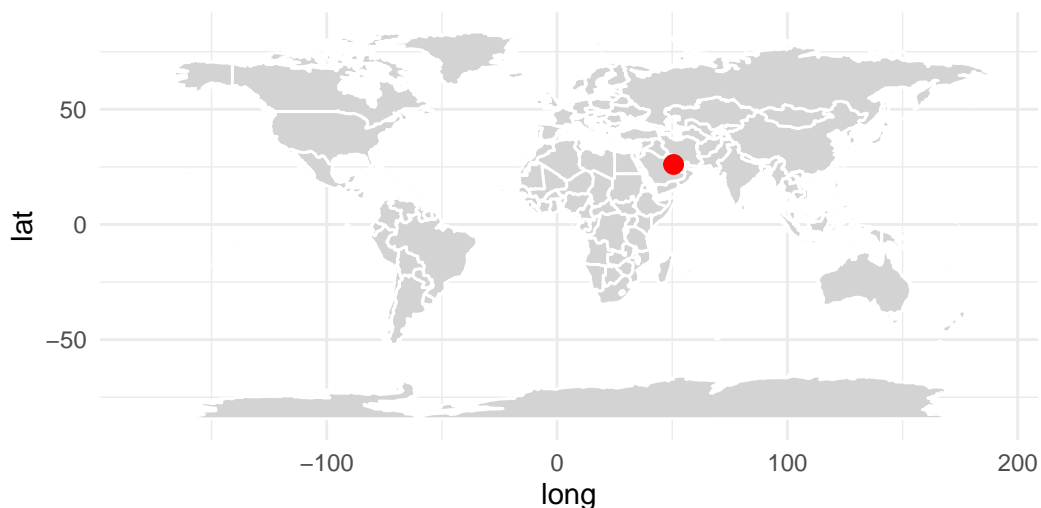
Dimension: XY  
Bounding box: xmin: 50.32461 ymin: 25.57122 xmax: 50.82301 ymax: 26.34238  
Geodetic CRS: WGS 84

```
ggplot(data = bahrain) +  
  geom_sf(fill = "lightblue", color = "darkblue") +  
  theme_minimal() +  
  labs(title = "Map of Bahrain")
```



```
library(maps)  
world <- map_data("world")  
  
ggplot() +  
  geom_polygon(data = world, aes(x = long, y = lat, group = group),  
              fill = "lightgray", color = "white") +  
  geom_point(aes(x = 50.5832, y = 26.0667), color = "red", size = 3) +  
  # Coordinates for Bahrain  
  theme_minimal() +  
  labs(title = "Bahrain's Location in the World") +  
  coord_quickmap()
```

## Bahrain's Location in the World



### Government

Bahrain is a constitutional monarchy led by King Hamad bin Isa Al Khalifa, with a government structure that blends traditional monarchy and modern governance. The bicameral legislature includes the Council of Representatives, elected by citizens, and the Shura Council, appointed by the King. This framework supports Bahrain's progressive approach to governance, fostering political stability and enabling the country's active participation in regional initiatives as a member of the Gulf Cooperation Council (GCC).

### Economy

Bahrain's economy is one of the most diverse in the Gulf region, driven by key sectors such as finance, oil, and tourism. While oil production has historically been a cornerstone of the economy, Bahrain has proactively reduced its dependence on oil by becoming a regional financial hub, with banking and insurance industries contributing significantly to its GDP. The country has also invested in developing its tourism sector, leveraging attractions such as its rich cultural heritage and modern infrastructure.

## **Population**

Bahrain is home to a diverse population of over 1.7 million people, comprising both Bahraini nationals and a significant expatriate community. This multicultural society reflects the country's historical role as a trade hub, attracting people from across the Middle East, South Asia, and beyond. Bahrainis enjoy a high literacy rate and access to advanced healthcare and education systems. The local culture is deeply rooted in Arab traditions, yet it is enriched by the presence of expatriates who contribute to the country's workforce, particularly in sectors like construction, finance, and services.

## **Environment**

Bahrain's natural environment is characterized by its arid climate, low-lying desert terrain, and surrounding waters of the Arabian Gulf. The nation comprises 33 islands, with Bahrain Island being the largest. Despite its small size and limited freshwater resources, Bahrain is home to diverse marine life and important ecosystems like mangroves and coral reefs. These ecosystems play a vital role in supporting biodiversity and protecting the coastline. However, the natural environment faces challenges such as land reclamation, desertification, and the impacts of climate change, including rising sea levels and extreme heat. Bahrain is actively working to address these issues through environmental conservation initiatives and sustainable urban planning.

## **History**

Bahrain has a rich history that dates back thousands of years, making it one of the most ancient trading hubs in the Gulf region. Known in antiquity as Dilmun, it served as a vital center for trade between Mesopotamia and the Indus Valley. Over centuries, Bahrain was ruled by various empires, including the Assyrians, Babylonians, Persians, and later the Portuguese in the 16th century. In 1783, the Al Khalifa family established control, and Bahrain became a British protectorate in the 19th century. The country gained independence in 1971 and has since developed into a modern state while preserving its historical and cultural heritage. Today, Bahrain's legacy as a bridge between ancient civilizations and modern economic progress continues to define its identity.

## **Average Expenditure Per Visitor Per Trip**

### **Data Description**

The dataset we choose provides insights into Bahrain's tourism economy by capturing the average daily expenditure per visitor in Bahraini Dinars (BHD) from 2017 to 2023, except 2020.

It includes spending data for same-day visitors, overnight visitors, and the total visitor average, segmented by year and month. This information helps analyze seasonal trends, spending behaviors, and the overall economic impact of tourism in Bahrain.

```
library(readr)
exp_data <- read_csv("01-average-expenditure-per-visitor-per-trip.csv")
```

```
Rows: 84 Columns: 6
```

```
-- Column specification -----
```

```
Delimiter: ","
```

```
chr (1): Month
```

```
dbl (5): N, Year, Average Daily Spend
```

```
Same-day Visitors (BHD), Average Daily...
```

```
i Use `spec()` to retrieve the full column specification for this data.
```

```
i Specify the column types or set `show_col_types = FALSE` to quiet this message.
```

```
head(exp_data)
```

```
# A tibble: 6 x 6
```

	N	Year	Month	Average Daily Spend\nSame-day Vi~1	Average Daily Spend~2
	<dbl>	<dbl>	<chr>	<dbl>	<dbl>
1	1	2017	January	64	70
2	2	2017	February	65.8	80.4
3	3	2017	March	69.9	84.7
4	4	2017	April	112.	104.
5	5	2017	May	106.	95.5
6	6	2017	June	84.3	115.

```
# i abbreviated names: 1: `Average Daily Spend\nSame-day Visitors (BHD)`,
```

```
# 2: `Average Daily Spend\nOvernight Visitors (BHD)`
```

```
# i 1 more variable: `Average Daily Spend\nTotal Visitors (BHD)` <dbl>
```

## EDA

The data set contains no missing data, so we will explore the data through several plots. However, the year 2020 contains several 0 values for same-day visitor expenditures. These values are not missing data but reflect the real-world impact of the COVID-19 pandemic, during which same-day travel to Bahrain was restricted due to global travel bans and safety measures. Keeping these 0 values is important as they represent the true disruption in visitor activity during that period, providing critical insights into the pandemic's effect on Bahrain's tourism economy.

## Bar plot of Average Daily Spend Over Time

A line plot to show how average daily spend varies for each visitor type over time.

```
library(ggplot2)
library(dplyr)
```

Attaching package: 'dplyr'

The following objects are masked from 'package:stats':

filter, lag

The following objects are masked from 'package:base':

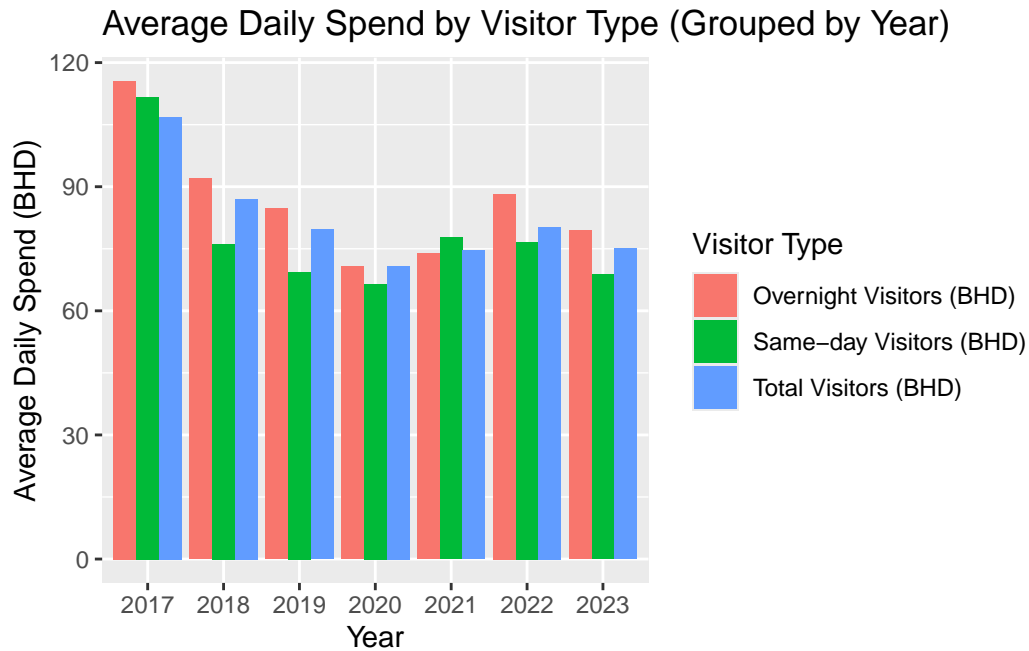
intersect, setdiff, setequal, union

```
library(tidyr)

exp_data_long <- exp_data %>%
  pivot_longer(
    cols = starts_with("Average Daily Spend"),
    names_to = "Visitor_Type",
    values_to = "Average_Spend"
  )

# Clean Visitor_Type labels for better readability
exp_data_long$Visitor_Type <- gsub("Average Daily Spend\\n", "", exp_data_long$Visitor_Type)

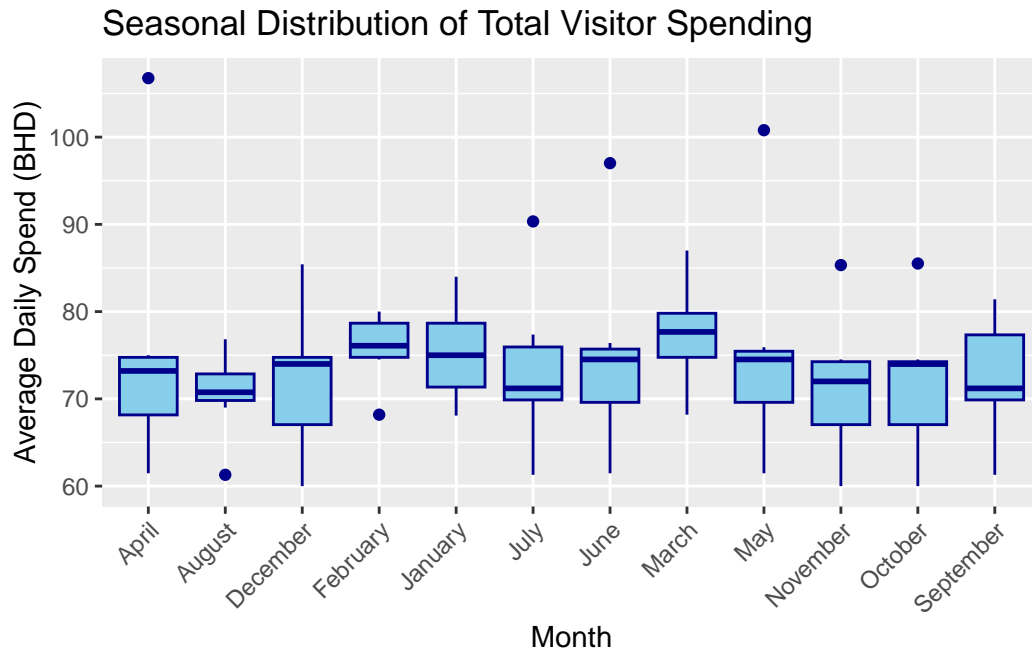
# Create the grouped bar plot
ggplot(exp_data_long, aes(x = as.factor(Year), y = Average_Spend, fill = Visitor_Type)) +
  geom_bar(stat = "identity", position = "dodge") +
  labs(
    title = "Average Daily Spend by Visitor Type (Grouped by Year)",
    x = "Year",
    y = "Average Daily Spend (BHD)",
    fill = "Visitor Type"
  )
```



### Box plot of Seasonal Trends

A box plot to visualize the seasonal distribution of average spending across months.

```
ggplot(exp_data, aes(x = Month, y = `Average Daily Spend\nTotal Visitors (BHD)`)) +
  geom_boxplot(fill = "skyblue", color = "darkblue") +
  labs(
    title = "Seasonal Distribution of Total Visitor Spending",
    x = "Month",
    y = "Average Daily Spend (BHD)"
  ) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



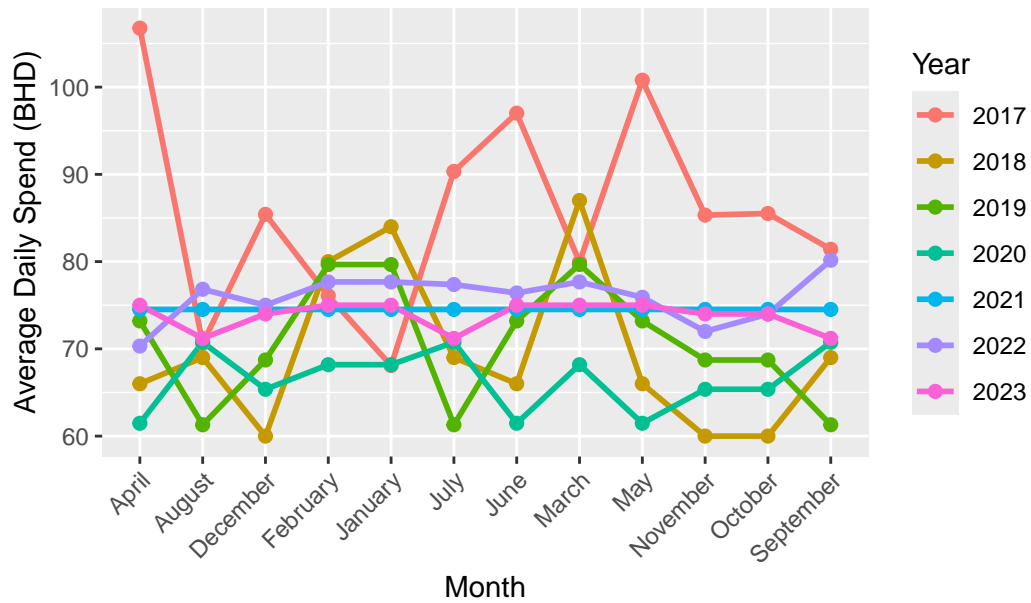
#### Average Daily Spend for Total Visitors

```
ggplot(exp_data, aes(x = Month, y = `Average Daily Spend\nTotal Visitors (BHD)`, color = as.factor(Year))) +
  geom_line(size = 1) +
  geom_point(size = 2) +
  labs(
    title = "Average Daily Spend for Total Visitors by Month (2017-2023)",
    x = "Month",
    y = "Average Daily Spend (BHD)",
    color = "Year"
  ) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.  
 i Please use `linewidth` instead.



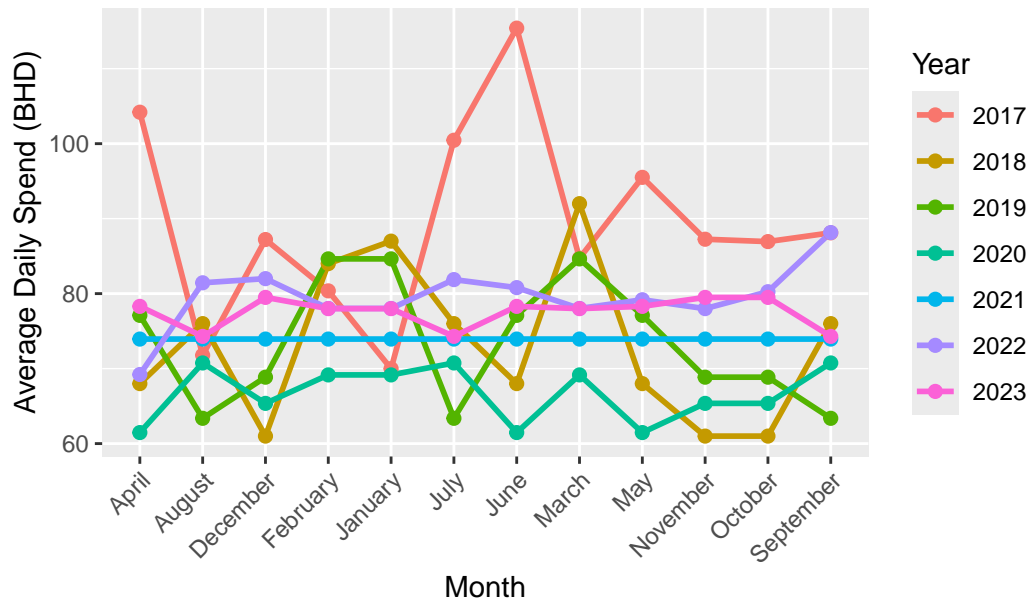
Average Daily Spend for Total Visitors by Month (2017–2023)



Average Daily Spend for Over Night Visitors

```
ggplot(exp_data, aes(x = Month, y = `Average Daily Spend\nOvernight Visitors (BHD)`, color =
  geom_line(size = 1) +
  geom_point(size = 2) +
  labs(
    title = "Average Daily Spend for Overnight Visitors by Month (2017-2023)",
    x = "Month",
    y = "Average Daily Spend (BHD)",
    color = "Year"
  ) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

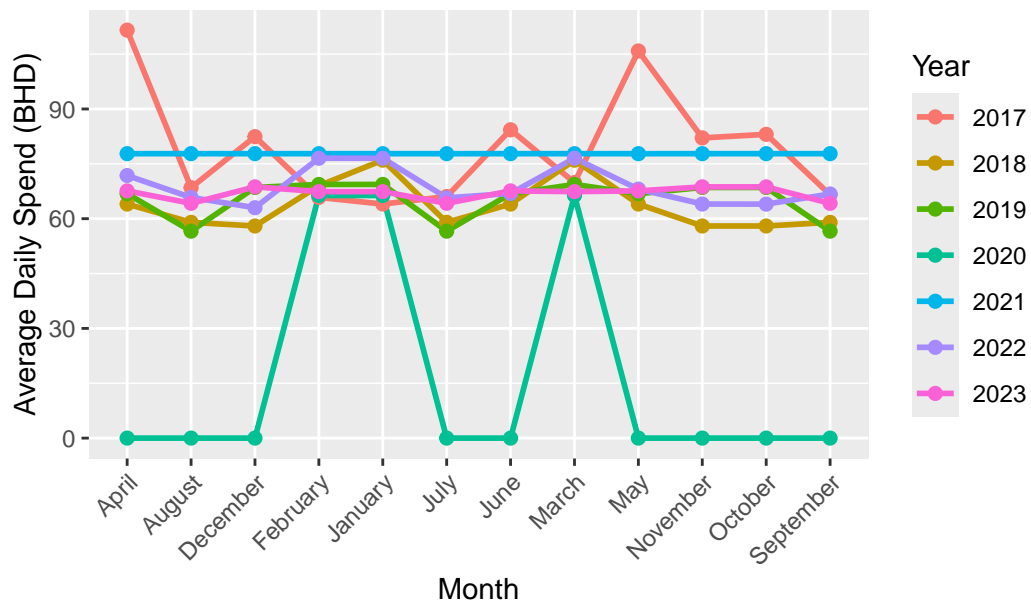
Average Daily Spend for Overnight Visitors by Month (2017–2023)



Average Daily Spend for Same Day Visitors

```
ggplot(exp_data, aes(x = Month, y = `Average Daily Spend\nSame-day Visitors (BHD)`, color = Year)) +
  geom_line(size = 1) +
  geom_point(size = 2) +
  labs(
    title = "Average Daily Spend for Same-Day Visitors by Month (2017-2023)",
    x = "Month",
    y = "Average Daily Spend (BHD)",
    color = "Year"
  ) +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

Average Daily Spend for Same-Day Visitors by Month (2017–2)



## Prediction For The Next Three Years

```
library(prophet)
```

Loading required package: Rcpp

Loading required package: rlang

```
library(lubridate)
```

Attaching package: 'lubridate'

The following objects are masked from 'package:base':

date, intersect, setdiff, union

```

# Convert Month to numeric
month_to_num <- function(month_name) {
  return(match(month_name, month.name))
}
exp_data$month_num <- sapply(exp_data$Month, month_to_num)

# Create proper date column
exp_data$date <- as.Date(paste(exp_data$Year, exp_data$month_num, "01", sep="-"))

# Prepare data for Prophet
prepare_prophet_data <- function(data, metric) {
  df <- data.frame(
    ds = data$date,
    y = data[[metric]]
  )
  return(df)
}

# Prophet model
create_forecast <- function(data, metric, future_years = 3) {
  prophet_data <- prepare_prophet_data(data, metric)

  # Fit model
  model <- prophet(
    prophet_data,
    yearly.seasonality = TRUE,
    weekly.seasonality = FALSE,
    daily.seasonality = FALSE,
    seasonality.mode = 'multiplicative'
  )

  # Create future dates
  future_dates <- make_future_dataframe(model, periods =
                                         future_years * 12,
                                         freq = "month")

  # Make prediction
  forecast <- predict(model, future_dates)
  forecast$ds <- as.Date(forecast$ds)
  return(list(model = model, forecast = forecast))
}

```

```

# Create forecasts for all three metrics
metrics <- c(
  "Average Daily Spend\nSame-day Visitors (BHD)",
  "Average Daily Spend\nOvernight Visitors (BHD)",
  "Average Daily Spend\nTotal Visitors (BHD)"
)

# Store results
forecasts <- list()
for (metric in metrics) {
  forecasts[[metric]] <- create_forecast(exp_data, metric)
}

# Plot forecasts
plot_forecast <- function(forecast_obj, metric_name) {
  # Extract actual dates and values
  actual_data <- data.frame(
    ds = as.Date(exp_data$date),
    y = exp_data[[metric_name]]
  )
  forecast_data <- forecast_obj$forecast
  forecast_data$ds <- as.Date(forecast_data$ds)

  ggplot() +
    # Actual values
    geom_point(data = actual_data, aes(x = ds, y = y,
                                       color = "Actual"),
              alpha = 0.6) +
    # Predicted values
    geom_line(data = forecast_data, aes(x = ds, y = yhat,
                                       color = "Predicted")) +
    # Confidence interval
    geom_ribbon(data = forecast_data,
              aes(x = ds, ymin = yhat_lower, ymax = yhat_upper),
              fill = "lightblue", alpha = 0.3) +
    # Formatting
    scale_color_manual(values = c("Actual" = "black",
                                  "Predicted" = "blue")) +
    scale_x_date(date_breaks = "6 months", date_labels = "%Y-%m") +
    labs(
      title = paste("Forecast for", gsub("\n", " ", metric_name)),
      x = "Date",

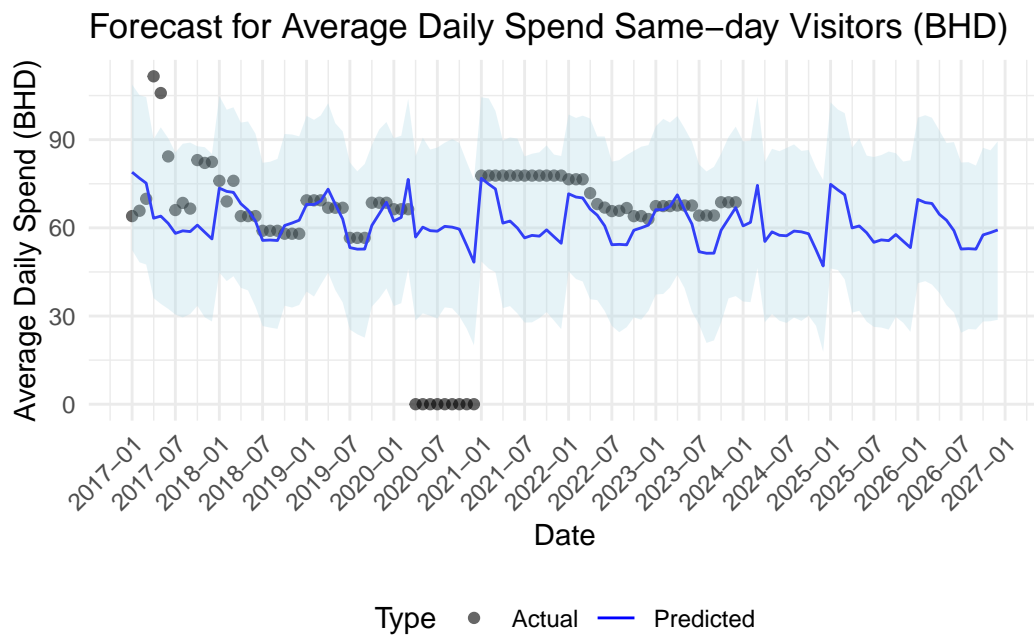
```

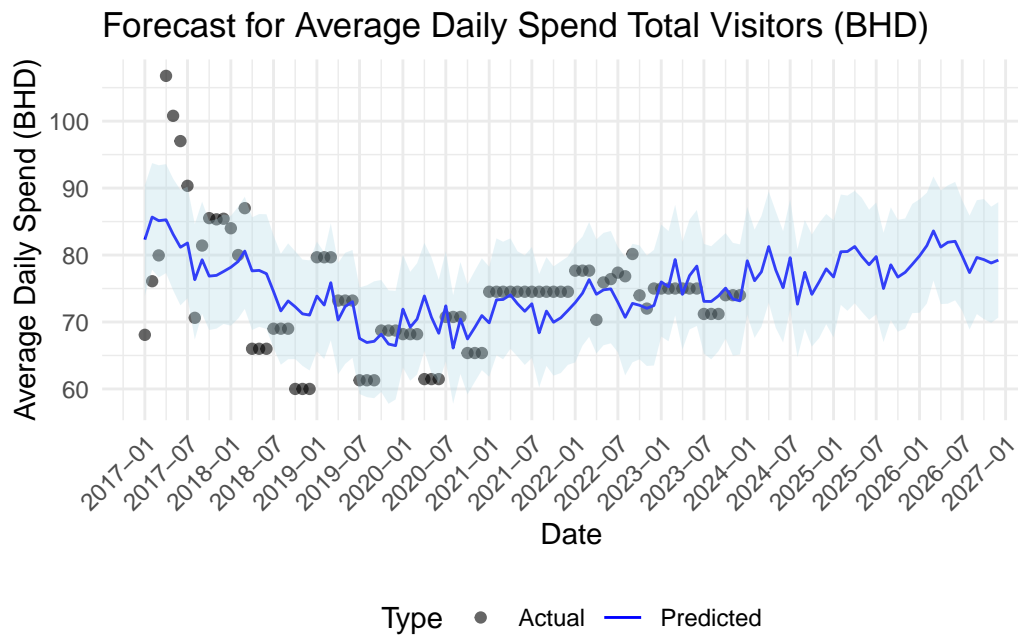
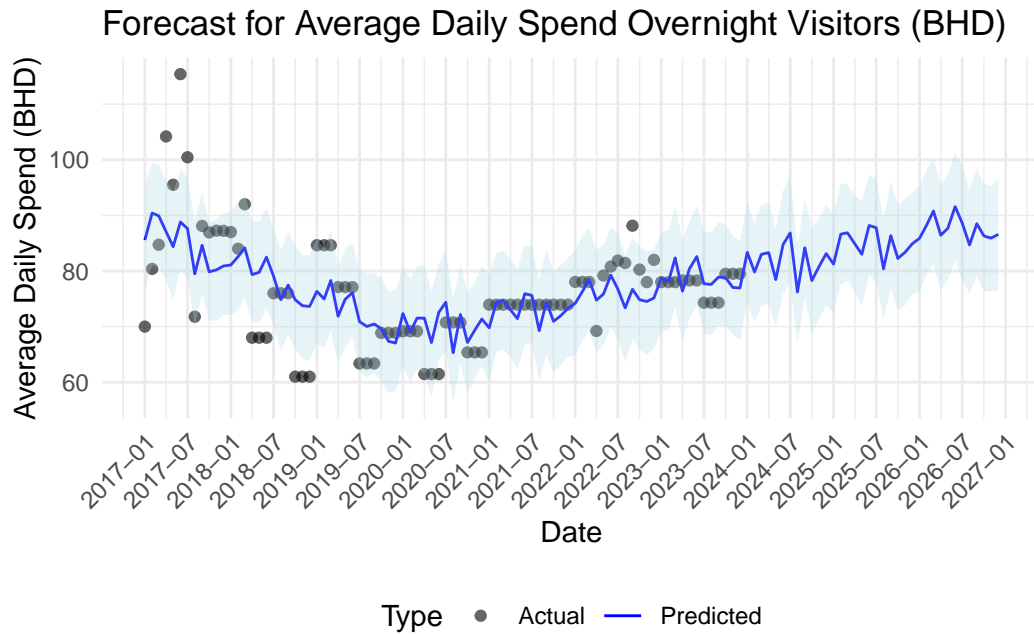
```

    y = "Average Daily Spend (BHD)",
    color = "Type"
  ) +
  theme_minimal() +
  theme(
    legend.position = "bottom",
    axis.text.x = element_text(angle = 45, hjust = 1)
  )
}

for (metric in names(forecasts)) {
  plot <- plot_forecast(forecasts[[metric]], metric)
  print(plot)
}

```





```
# Extract forecasted values for the next three years
get_forecast_summary <- function(forecast_obj, metric_name) {
  # Get only future predictions
  future_forecast <- tail(forecast_obj$forecast, 36) # 36 months
```

```

# Create summary dataframe
summary_df <- data.frame(
  Date = as.Date(future_forecast$ds),
  Metric = metric_name,
  Predicted_Value = round(future_forecast$yhat, 2),
  Lower_Bound = round(future_forecast$yhat_lower, 2),
  Upper_Bound = round(future_forecast$yhat_upper, 2)
)

return(summary_df)
}

forecast_summaries <- do.call(rbind, lapply(names(forecasts), function(metric) {
  get_forecast_summary(forecasts[[metric]], metric)
})))

forecast_summaries

```

	Date	Metric	Predicted_Value
1	2024-01-01	Average Daily Spend\nSame-day Visitors (BHD)	60.66
2	2024-02-01	Average Daily Spend\nSame-day Visitors (BHD)	61.86
3	2024-03-01	Average Daily Spend\nSame-day Visitors (BHD)	74.46
4	2024-04-01	Average Daily Spend\nSame-day Visitors (BHD)	55.37
5	2024-05-01	Average Daily Spend\nSame-day Visitors (BHD)	58.64
6	2024-06-01	Average Daily Spend\nSame-day Visitors (BHD)	57.47
7	2024-07-01	Average Daily Spend\nSame-day Visitors (BHD)	57.30
8	2024-08-01	Average Daily Spend\nSame-day Visitors (BHD)	58.90
9	2024-09-01	Average Daily Spend\nSame-day Visitors (BHD)	58.64
10	2024-10-01	Average Daily Spend\nSame-day Visitors (BHD)	57.99
11	2024-11-01	Average Daily Spend\nSame-day Visitors (BHD)	52.54
12	2024-12-01	Average Daily Spend\nSame-day Visitors (BHD)	47.03
13	2025-01-01	Average Daily Spend\nSame-day Visitors (BHD)	74.81
14	2025-02-01	Average Daily Spend\nSame-day Visitors (BHD)	72.87
15	2025-03-01	Average Daily Spend\nSame-day Visitors (BHD)	71.28
16	2025-04-01	Average Daily Spend\nSame-day Visitors (BHD)	59.97
17	2025-05-01	Average Daily Spend\nSame-day Visitors (BHD)	60.65
18	2025-06-01	Average Daily Spend\nSame-day Visitors (BHD)	58.32
19	2025-07-01	Average Daily Spend\nSame-day Visitors (BHD)	55.08
20	2025-08-01	Average Daily Spend\nSame-day Visitors (BHD)	55.90
21	2025-09-01	Average Daily Spend\nSame-day Visitors (BHD)	55.65
22	2025-10-01	Average Daily Spend\nSame-day Visitors (BHD)	57.73



23	2025-11-01	Average Daily Spend\nSame-day Visitors (BHD)	55.45
24	2025-12-01	Average Daily Spend\nSame-day Visitors (BHD)	53.28
25	2026-01-01	Average Daily Spend\nSame-day Visitors (BHD)	69.67
26	2026-02-01	Average Daily Spend\nSame-day Visitors (BHD)	68.59
27	2026-03-01	Average Daily Spend\nSame-day Visitors (BHD)	68.29
28	2026-04-01	Average Daily Spend\nSame-day Visitors (BHD)	64.62
29	2026-05-01	Average Daily Spend\nSame-day Visitors (BHD)	62.58
30	2026-06-01	Average Daily Spend\nSame-day Visitors (BHD)	59.05
31	2026-07-01	Average Daily Spend\nSame-day Visitors (BHD)	52.80
32	2026-08-01	Average Daily Spend\nSame-day Visitors (BHD)	52.92
33	2026-09-01	Average Daily Spend\nSame-day Visitors (BHD)	52.76
34	2026-10-01	Average Daily Spend\nSame-day Visitors (BHD)	57.60
35	2026-11-01	Average Daily Spend\nSame-day Visitors (BHD)	58.39
36	2026-12-01	Average Daily Spend\nSame-day Visitors (BHD)	59.29
37	2024-01-01	Average Daily Spend\nOvernight Visitors (BHD)	83.36
38	2024-02-01	Average Daily Spend\nOvernight Visitors (BHD)	79.81
39	2024-03-01	Average Daily Spend\nOvernight Visitors (BHD)	83.01
40	2024-04-01	Average Daily Spend\nOvernight Visitors (BHD)	83.30
41	2024-05-01	Average Daily Spend\nOvernight Visitors (BHD)	78.46
42	2024-06-01	Average Daily Spend\nOvernight Visitors (BHD)	84.77
43	2024-07-01	Average Daily Spend\nOvernight Visitors (BHD)	86.84
44	2024-08-01	Average Daily Spend\nOvernight Visitors (BHD)	76.22
45	2024-09-01	Average Daily Spend\nOvernight Visitors (BHD)	84.18
46	2024-10-01	Average Daily Spend\nOvernight Visitors (BHD)	78.29
47	2024-11-01	Average Daily Spend\nOvernight Visitors (BHD)	80.84
48	2024-12-01	Average Daily Spend\nOvernight Visitors (BHD)	83.13
49	2025-01-01	Average Daily Spend\nOvernight Visitors (BHD)	81.24
50	2025-02-01	Average Daily Spend\nOvernight Visitors (BHD)	86.63
51	2025-03-01	Average Daily Spend\nOvernight Visitors (BHD)	86.87
52	2025-04-01	Average Daily Spend\nOvernight Visitors (BHD)	84.91
53	2025-05-01	Average Daily Spend\nOvernight Visitors (BHD)	83.00
54	2025-06-01	Average Daily Spend\nOvernight Visitors (BHD)	88.18
55	2025-07-01	Average Daily Spend\nOvernight Visitors (BHD)	87.80
56	2025-08-01	Average Daily Spend\nOvernight Visitors (BHD)	80.39
57	2025-09-01	Average Daily Spend\nOvernight Visitors (BHD)	86.37
58	2025-10-01	Average Daily Spend\nOvernight Visitors (BHD)	82.25
59	2025-11-01	Average Daily Spend\nOvernight Visitors (BHD)	83.40
60	2025-12-01	Average Daily Spend\nOvernight Visitors (BHD)	84.89
61	2026-01-01	Average Daily Spend\nOvernight Visitors (BHD)	85.89
62	2026-02-01	Average Daily Spend\nOvernight Visitors (BHD)	88.34
63	2026-03-01	Average Daily Spend\nOvernight Visitors (BHD)	90.80
64	2026-04-01	Average Daily Spend\nOvernight Visitors (BHD)	86.43
65	2026-05-01	Average Daily Spend\nOvernight Visitors (BHD)	87.68

66	2026-06-01	Average Daily Spend\nOvernight Visitors (BHD)	91.58
67	2026-07-01	Average Daily Spend\nOvernight Visitors (BHD)	88.61
68	2026-08-01	Average Daily Spend\nOvernight Visitors (BHD)	84.69
69	2026-09-01	Average Daily Spend\nOvernight Visitors (BHD)	88.51
70	2026-10-01	Average Daily Spend\nOvernight Visitors (BHD)	86.30
71	2026-11-01	Average Daily Spend\nOvernight Visitors (BHD)	85.91
72	2026-12-01	Average Daily Spend\nOvernight Visitors (BHD)	86.59
73	2024-01-01	Average Daily Spend\nTotal Visitors (BHD)	79.15
74	2024-02-01	Average Daily Spend\nTotal Visitors (BHD)	76.16
75	2024-03-01	Average Daily Spend\nTotal Visitors (BHD)	77.49
76	2024-04-01	Average Daily Spend\nTotal Visitors (BHD)	81.27
77	2024-05-01	Average Daily Spend\nTotal Visitors (BHD)	77.76
78	2024-06-01	Average Daily Spend\nTotal Visitors (BHD)	75.11
79	2024-07-01	Average Daily Spend\nTotal Visitors (BHD)	79.60
80	2024-08-01	Average Daily Spend\nTotal Visitors (BHD)	72.66
81	2024-09-01	Average Daily Spend\nTotal Visitors (BHD)	77.42
82	2024-10-01	Average Daily Spend\nTotal Visitors (BHD)	74.13
83	2024-11-01	Average Daily Spend\nTotal Visitors (BHD)	76.00
84	2024-12-01	Average Daily Spend\nTotal Visitors (BHD)	77.94
85	2025-01-01	Average Daily Spend\nTotal Visitors (BHD)	76.73
86	2025-02-01	Average Daily Spend\nTotal Visitors (BHD)	80.49
87	2025-03-01	Average Daily Spend\nTotal Visitors (BHD)	80.53
88	2025-04-01	Average Daily Spend\nTotal Visitors (BHD)	81.28
89	2025-05-01	Average Daily Spend\nTotal Visitors (BHD)	79.81
90	2025-06-01	Average Daily Spend\nTotal Visitors (BHD)	78.55
91	2025-07-01	Average Daily Spend\nTotal Visitors (BHD)	79.77
92	2025-08-01	Average Daily Spend\nTotal Visitors (BHD)	75.00
93	2025-09-01	Average Daily Spend\nTotal Visitors (BHD)	78.54
94	2025-10-01	Average Daily Spend\nTotal Visitors (BHD)	76.70
95	2025-11-01	Average Daily Spend\nTotal Visitors (BHD)	77.42
96	2025-12-01	Average Daily Spend\nTotal Visitors (BHD)	78.60
97	2026-01-01	Average Daily Spend\nTotal Visitors (BHD)	79.88
98	2026-02-01	Average Daily Spend\nTotal Visitors (BHD)	81.41
99	2026-03-01	Average Daily Spend\nTotal Visitors (BHD)	83.61
100	2026-04-01	Average Daily Spend\nTotal Visitors (BHD)	81.19
101	2026-05-01	Average Daily Spend\nTotal Visitors (BHD)	81.91
102	2026-06-01	Average Daily Spend\nTotal Visitors (BHD)	82.05
103	2026-07-01	Average Daily Spend\nTotal Visitors (BHD)	79.85
104	2026-08-01	Average Daily Spend\nTotal Visitors (BHD)	77.38
105	2026-09-01	Average Daily Spend\nTotal Visitors (BHD)	79.64
106	2026-10-01	Average Daily Spend\nTotal Visitors (BHD)	79.32
107	2026-11-01	Average Daily Spend\nTotal Visitors (BHD)	78.81
108	2026-12-01	Average Daily Spend\nTotal Visitors (BHD)	79.24

	Lower_Bound	Upper_Bound
1	34.94	89.41
2	34.72	89.65
3	46.29	104.51
4	27.91	82.39
5	30.67	86.88
6	28.40	86.07
7	27.66	87.18
8	29.49	88.39
9	28.34	86.18
10	30.14	86.48
11	26.68	80.54
12	17.84	76.26
13	46.19	102.69
14	45.64	100.23
15	42.45	99.04
16	31.15	87.27
17	31.78	90.34
18	28.08	84.57
19	26.32	84.10
20	26.08	84.75
21	25.40	85.96
22	29.68	85.40
23	27.70	82.56
24	24.64	83.00
25	41.15	97.48
26	41.87	98.31
27	40.70	97.47
28	37.88	93.14
29	33.72	88.88
30	31.17	89.17
31	24.31	82.24
32	25.57	82.34
33	25.43	81.18
34	28.13	87.25
35	28.24	86.37
36	28.71	89.40
37	74.67	92.21
38	70.72	88.63
39	73.72	91.84
40	74.21	92.37
41	69.95	87.50
42	75.92	94.42

43	77.78	96.99
44	66.88	84.43
45	75.41	92.88
46	68.77	87.76
47	71.44	89.51
48	73.86	91.93
49	72.38	90.26
50	77.63	95.87
51	78.28	95.49
52	76.26	93.70
53	73.67	92.52
54	79.24	97.23
55	77.99	96.67
56	71.34	89.46
57	76.81	96.07
58	72.92	91.75
59	73.86	92.95
60	75.83	94.12
61	76.29	95.32
62	79.33	98.28
63	81.31	100.21
64	76.44	95.63
65	78.44	97.38
66	81.91	101.30
67	78.29	98.92
68	76.02	94.62
69	79.02	98.30
70	76.44	95.64
71	76.31	95.31
72	76.40	96.51
73	71.08	87.18
74	67.63	83.80
75	69.27	85.82
76	72.87	89.51
77	69.12	86.53
78	66.95	83.57
79	71.90	88.36
80	64.74	80.88
81	68.98	85.24
82	66.33	83.06
83	67.60	84.79
84	69.66	86.12
85	67.69	85.21

86	72.56	89.04
87	71.67	88.88
88	72.80	89.59
89	71.53	88.55
90	70.32	86.77
91	71.15	87.85
92	67.00	83.33
93	70.29	87.12
94	68.55	85.27
95	69.02	85.46
96	71.32	87.64
97	71.38	88.33
98	72.77	89.31
99	76.19	91.72
100	72.67	89.65
101	72.73	90.40
102	73.24	90.92
103	71.67	88.17
104	68.88	85.90
105	71.18	88.19
106	70.44	88.37
107	69.88	87.23
108	70.65	87.89