TWT 2231
WEB TECHNIQUES AND APPLICATIONS

Individual Assignment

Trimester 2, Session 2024 / 10

No.	Student ID	Student Name	Majoring
1.	1221303010	Khor Wan Ping	BIA

Contents

Background

As era continuous to process, technology and industry has bring great conveniences and prosperity for us, but also come with a series of challenges such as air pollution. Air pollution had become one of the global concerns nowadays. It is not just an environmental issue, but also a directly threat to human's health. The increase in diseases such as stroke, lung cancer and heart disease are all closely related to the decline in air quality.

To better understand air quality, we utilize Air Quality Index (AQI). According to the range of AQI, air quality had been categories into 6 level, from 'excellent' to 'severe pollution', which easier for us to know the current air quality status and take appropriate protective measures. The following table defines the AQI classes as defined by the US-EPA 2016 standards:

Air Quality Index (AQI)	**Air Quality Level (Condition)**	**Colour Representation**	**Health Impact**
0 - 50	Level 1 (Excellent)	Green	Minimal pollution, safe for all activities.
51 - 100	Level 2 (Good)	Yellow	Acceptable air quality, minor impact on sensitive individuals.
101-150	Level 3 (Light Pollution)	Orange	Slight aggravation of symptoms for sensitive groups.
151-200	Level 4 (Moderate Pollution)	Red	Worsening symptoms for sensitive groups; moderate impact on healthy individuals.
201-300	Level 5 (Heavy Pollution)	Purple	Significant worsening of symptoms for patients; symptoms may appear in healthy individuals.
300+	Level 6 (Severe Pollution)	Brown	Decreased tolerance for physical activity, noticeable and intense symptoms.

This project is to create an AQI website for Southeast Asia, enable people to obtain the air quality information of the place they are in, and offer correspond prevention suggestion. By raising awareness of the problem of air pollution, we hope to draw more people's attention and explore solutions together to promote environmental protection and healthy living.

Objective

There are several objects for this website:

1. **User friendly interface:** The site is designed to serve people of all ages, from children to the elderly, with access to Air Quality Index (AQI) information. It includes a simple and clear design interface ensures that every user can get or search for the information they desire to know easily. Additionally, an easy read font size make it a user-friendly website to elder or other special people.

2. **Increase public awareness on air pollution:** This website will offer a 'Causes and effect' section. In this part, it will provide some common knowledge about the causes and effect of air pollution. This content aim to educate user on the harmful of air pollution.

3. **AQI table:** An AQI table including explanations such as Air Pollution Level, Health Implications and Cautionary Statement (for PM2.5). This content aims to make it easier for the public to understand the significance of air quality and its impact on their well-being.

4. **Way to decrease or prevent air pollution:** A lot of people had awareness about this issue, but they have no idea on how to prevent it. Provide specific recommendations and guidelines for action to help individuals and communities reduce air pollution, e.g., reduce car use, increase greening, etc.

5. **Real-time update:** This website aims to deliver a time-to-time update on the air quality status of Southeast Asia area. Real-time updates provide the most current and accuracy information which can help them in making decisions whether to do any protection.

6. **Accessible and Reliable:** The website design should be consistent across a variety of devices and browsers to provide users with a good user experience by allowing them to view the web page in its entirety, regardless of the device they are formally using.

In addition, the most important thing is the reliability of the data. We use data from authoritative government agencies and environmental organizations to ensure that air quality information is accurate and credible.

By achieving these goals, the website will not only deliver a user-friendly interface, but will also effectively promote public awareness on air pollution, provide strategies to reduce and prevent air pollution, and verify that users have access to accurate information through real-time updates and reliable data.

Potential user and user specific requirements

This website primarily serves tourists, residents, national health organizations, businesses, and other educational institution.

1. **Tourists**

   Travelers often use the Air Quality Index (AQI) to determine whether to visit a nation and whether the air quality will be damaging to their health. The website provides up-to-date information on air quality, which helps tourists plan their trips and make informed decisions.

2. **Residents / General Public**

   Even while residents can't totally avoid being exposed to ambient air, they can take the appropriate precautions by having access to reliable AQI data. This may entail donning masks or other protective gear or remaining inside during periods of high pollution.

3. **National Health Organizations**

   With the use of this data, national health organizations can better inform the public about air quality issues and encourage action to improve the quality of the air. In order to safeguard the public's health, these data assist organizations in tracking trends in air quality and putting health advice and regulations into action.

4. **Businesses and organizations**

   Companies can use AQI data to make well-informed decisions, including producing more masks and other protective gear when the air quality is bad. This guarantees a balance between supply and demand and helps cut down on waste.

5. **Educational Institutions**

   Schools and universities can use the website to educate students about air quality and its impacts, promoting awareness and encouraging preventive measures

Program Scope

The program of this website includes several features, deliverable and constraints.

4.1 Features and functions

First, we will discuss on the feasibility of this website.

1. **Real time Air Quality Index**
    - This website mainly focuses on Air Quality of country in Southeast Asia, which including Brunei Darussalam, Cambodia, Timor-Leste, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam.
    - Some of the countries may include a few states' AQI for example, Malaysia will include Melacca, Johor Bahru, Kuala Lumpur, Peris and so on.
    - Color-coded which can visually explain the AQI are also included.
    - Except for Southeast Asian countries, a world map containing simplified AQI of each country allows users to simply understand the global air quality.

2. **Drop-down menu and interactive map**
    - Click-able maps and drop-down menus allow users to easily click or select the country they want to view based on their preferences.

3. **Air pollution prevention method**
    - To effectively decrease the air pollution status of every country, methods to increase air quality and prevention of air pollution are provided
    - Prevention method provided in a clear and concise explanation with list format, improve the understanding of the uses.
    - Image that related to each approach also help to improve understanding.

4. **Cause and effect of air pollution**
    - To raise public awareness on the harmful effects of air pollution.
    - Animation effect can help to raise the attractiveness of user.

5. **Contact form**
    - A contact form is used to gather feedback from user, in order to enhance website's features and functionality
    - Comparing to email, contact form involve less friction as it provides a clear structure which leading a more seamless contact experience to users.
    - 'POST' method used to protect users' privacy.

6. **AQI reading instructions**
    - Table that includes AQI, Air pollution level, health implications and cautionary statements are provided.
    - For those who are less knowledge on AQI, this will be a useful table that can help to understand how AQI is presented.

4.2 Deliverable

1. **AQIMY website**
    - It offers a user-friendly, intuitive, and visually appealing to enhance the overall user experience.
    - Real-time update on the AQI of each country in Southeast Asia.
    - All functions that state in the ‘Program scope’ part are involved.
    - User can access this website using various type of devices such as tablet, desktop, smart phone and others.

2. **Final report**
    - Explanation and overview of this website are included.
    - Screenshots and mock-ups of the website to visually demonstrate the user interface and functionality.

3. **System Platform**
    - Hardware requirements
        - Devices
            - To access this website, users need at least one internet-enabled device. The website is designed to be accessible from a variety of devices, ensuring a wide reach and convenience for users.

        - Network equipment
            - Given that this website is online-based, proper networking equipment is crucial to ensure a smooth and secure user experience. Network equipment facilitates the connection between users and the website's server, enabling real-time data retrieval and interaction.

        - Web server
            - The web server is the backbone of the website, handling all requests from users and serving the appropriate web pages and data.

    - Software requirements

- Web development component
  - The development of the website involves a combination of technologies and frameworks to ensure a robust, responsive, and user-friendly platform.
    i. HTML

    HTML is mostly used in this project to outline the website's content and structure. It serves as the framework for web pages, specifying components like lists, headings, paragraphs, and forms to efficiently arrange content.

    ii. CSS

    When creating a user interface, CSS is used to improve the website's aesthetic appeal. By applying design principles, managing layouts, and stylistically arranging elements, it guarantees completeness and consistency while creating an aesthetically beautiful and user-friendly website.

    iii. JavaScript

    JavaScript is used to improve user interaction on the website. It enables dynamic responses to user actions, such as clicking buttons or performing other interactions, thereby enhancing the overall user experience with interactive and engaging features.

    iv. Bing Maps API

    The Bing Maps API is used to display an interactive map, enabling users to click on it and retrieve AQI data for each country. This enhances the user experience by providing a visual and interactive method for exploring air quality information across different regions.

    v. AQICN Token

    AQICN is a service used to extract and display AQI data for each country. It integrates with Leaflet to provide an overview

of AQI data worldwide. This integration allows the website to present comprehensive air quality information in a visually engaging and informative manner.

vi. Formspree

Formspree is a useful tool for real-time collecting feedback from user. Feedback submitted is stored and posted securely online. This is an important tool which can help to enhancing the website

4.3 Constraints

1. **Device Compatibility:** The website is divided among sections that are optimized for mobile use and others that are not. Because of this discrepancy, some functionalities on mobile devices could not be as easily accessible or aesthetically pleasing, which could result in a less than ideal user experience.

2. **Limited Geographic Data:** Our website focuses exclusively on the Southeast Asia region. For users who want to know the AQI of countries outside this region, the website is relatively less useful. This limitation can be a drawback for users seeking comprehensive global air quality information.

3. **HTTP instead of HTTPS:** The website uses HTTP instead of HTTPS. Since the contact form often requires a more secure path to send and receive user data, the use of HTTP makes the website relatively less secure. This lack of security can be a concern for users who are cautious about their personal information.

4. **Lack of Historical Data:** The website currently lacks historical AQI data, which could be valuable for users interested in analysing trends over time. This limitation reduces the website's usefulness for long-term environmental studies and personal health tracking.

Design Issues

1. **Colour Classification:** The design concept of colour classification focuses on implementing a coherent colour scheme that intuitively communicates different AQI levels to users. The website makes sure that air quality levels are depicted clearly, ranging from good to hazardous, by using a gradient scale that runs from green to red. In addition to improving aesthetic appeal, this method complies with accessibility guidelines by guaranteeing adequate colour contrast to make text readable against various background hues.

2. **Visual Map:** The purpose of the visual map is to provide users with an interactive information tool that makes it simple to study AQI data. Users may easily understand the air quality conditions in various places by seeing the AQI levels shown in colour on the map. When a user clicks over a particular location, interactive elements like tooltips provide detailed information, which improves user engagement and comprehension of the data. The goal of this design strategy is to simplify difficult information and make it visually appealing

3. **Navigation Menu:** The website's user experience can be made simpler with a clear and simple navigation menu. Sections including AQI data, preventative techniques, and contact details are all easily accessible to users because to the content's logical categorization and hierarchical menu layout. This design makes sure that crucial information is in plain sight, which contributes to a seamless surfing experience across a range of gadgets and screen sizes.

4. **Interactive Map:** Adding the ability for users to dynamically interact with the AQI data is one way to improve the interactive map. To ensure that the data appropriately reflects the current situation, users can click on the map area to receive specific information about the air quality in real time. The user experience is further enhanced by the integration of tools that enable zooming, panning, and the overlaying of additional data, such as weather conditions, making the map an essential resource for investigating and comprehending air quality insights.

5. **Drop-down Search Menu:** This menu is made to make it easier to quickly retrieve particular AQI data for various areas. By offering a more straightforward search experience, this feature enhances user happiness by ensuring usability across a range of browsers and devices.

6. **Contact Us Section:** The "Contact Us" section is designed to encourage user interaction and feedback. It features a contact form with name, email, and message fields, ensuring users can easily raise queries or comments. Clearly displaying contact information such as email addresses and phone numbers enhances transparency and accessibility, fostering trust and increasing user engagement with the site.

7. **Prevention methods:** Effectively presenting prevention methods involves organizing actionable tips into concise sections that educate users on how to mitigate the effects of poor air quality. This design approach aims to educate and empower users with easy-to-understand and informative content.

8. **Responsive interface:** The design prioritizes a responsive interface that seamlessly adapts across devices, ensuring consistent performance and user experience. Using responsive design principles, the site dynamically adjusts layout and content based on screen size and orientation. Thoroughly tested and optimized, users can easily access air quality information whether they are on a desktop, tablet, or smartphone.

9. **Animation design:** Motion design is carefully utilized to enhance user engagement without compromising usability. Subtle animations are used to draw the user’s attention to important updates or interactive elements, enriching the browsing experience without compromising functionality.

These design concepts combine to create a cohesive and user-centric experience on the MAQI website, emphasizing accessibility, usability, and engagement to present key air quality information to users.

Important Code / Implementation

loadMap() - (Map)

```
function loadMap() {
    var mapOptions = {
        credentials: 'ApJGcMCFudIIZ7yS2B-RWQ7L4ZpdZbdRS-bJsWtUaFset71I7XlAKDjF_O78w264',
        center: new Microsoft.Maps.Location(7.298488, 117.121439),
        mapTypeId: Microsoft.Maps.MapTypeId.road,
        zoom: 4
    };

    var map1 = new Microsoft.Maps.Map(document.getElementById('map1'), mapOptions);

    var locations = [
        { latitude: 4.5353, longitude: 114.7277, name: 'Brunei Darussalam' },
        { latitude: 12.5657, longitude: 104.9910, name: 'Cambodia' },
        { latitude: -8.8742, longitude: 125.7275, name: 'Timor-Leste' },
        { latitude: -0.7893, longitude: 113.9213, name: 'Indonesia' },
        { latitude: 19.8563, longitude: 102.4955, name: 'Laos' },
        { latitude: 4.2105, longitude: 101.9758, name: 'Malaysia' },
        { latitude: 21.9162, longitude: 95.9560, name: 'Myanmar' },
        { latitude: 12.8797, longitude: 121.7740, name: 'Philippines' },
        { latitude: 1.3521, longitude: 103.8198, name: 'Singapore' },
        { latitude: 15.8700, longitude: 100.9925, name: 'Thailand' },
        { latitude: 14.0583, longitude: 108.2772, name: 'Vietnam' }
    ];

    locations.forEach((location) => {
        var pin = new Microsoft.Maps.Pushpin(new Microsoft.Maps.Location(location.latitude, location.longitude));
        pin.metadata = {
            title: location.name
        };

        Microsoft.Maps.Events.addHandler(pin, 'click', function(e) {
            goLoc(location.name);
        });

        map1.entities.push(pin);
    });
}
```

This code is mainly used to retrieve a world map and push pin on the map. Latitude and Longitude are used to specify the location of the country.

initBingMap() - (visualization map)

```
// data visuallization map
function initBingMap() {
    var OSM_URL = 'http://{s}.tile.openstreetmap.org/{z}/{x}/{y}.png';
    var OSM_ATTRIB = '&copy; <a href="http://openstreetmap.org/copyright">OpenStreetMap</a> contributors';
    var osmLayer = L.tileLayer(OSM_URL, { attribution: OSM_ATTRIB });

    var WAQI_URL = "https://tiles.waqi.info/tiles/usepa-aqi/{z}/{x}/{y}.png?token=6b0d382a44bd94d03f5e6cf8ae863705f04c47a4";
    var WAQI_ATTR = 'Air Quality Tiles &copy; <a href="http://waqi.info">waqi.info</a>';
    var waqiLayer = L.tileLayer(WAQI_URL, { attribution: WAQI_ATTR });

    var map = L.map('map2').setView([51.505, -0.09], 11);
    map.addLayer(osmLayer).addLayer(waqiLayer);
}
```

This code is used to load a visualisation map that integrate with Leaflet.

getParameterByName ()

```
function getParameterByName(name, url = window.location.href) {
            name = name.replace(/[\[\]]/g, '\\$&');
            var regex = new RegExp('[?&]' + name + '(=([^&#]*)|&|#|$)'),
                results = regex.exec(url);
            if (!results) return null;
            if (!results[2]) return '';
            return decodeURIComponent(results[2].replace(/\+/g, ' '));
        }
```

This code is used to extract a query parameter with a specified name from a URL, and constructs a regular expression that matches a parameter name and corresponding value in it. Lastly, decode the parameter values and replaces the plus signs in them.

Immediate Invocation Function Expressions (IIFE)

```
(function (w, d, t, f) {
            w[f] = w[f] || function (c, k, n) {
                s = w[f], k = s['k'] = (s['k'] || (k ? ('&k=' + k) : ''));
                s['c'] = c = (c instanceof Array) ? c : [c];
                s['n'] = n = n || 0;
                L = d.createElement(t), e = d.getElementsByTagName(t)[0];
                L.async = 1;
                L.src = '//feed.aqicn.org/feed/' + (c[n].city) + '/' + (c[n].lang || '') + '/feed.v1.js?n=' + n + k;
                e.parentNode.insertBefore(L, e);
            };
        })(window, document, 'script', "_aqiFeed");
```

This code is used to dynamically load a JavaScript file from feed.aqicn.org with the appropriate AQI data source script based on the city and language parameters provided.

Evaluation and Contribution

Evaluation

This website has met the aims, goals and user requirements.

1. **Real-time and reliable information**

   This website effectively satisfies the need to offer trustworthy and up-to-date information on air quality. Through the use of the Bing Maps API and integration with the AQICN token, the website guarantees that users can obtain up-to-date, correct AQI data. With the help of this tool, users can base their judgments on the most recent measurements of the air quality.

2. **Raising awareness**

   The website makes a significant contribution to increasing public awareness of air pollution. It informs users of the state of the air quality in their area right now and draws attention to any possible health risks related to poor air quality. The website urges people to take proactive steps to lessen their exposure to air pollution by raising awareness and comprehension.

3. **User friendly interface**

   It provides an intuitive user interface that improves usability and accessibility. Users may easily explore the website and quickly get the information they need thanks to its design. It is simpler for consumers to obtain and comprehend information about air quality thanks to features including responsive design, easy-to-navigate interfaces, and clear data display.

4. **Interactive**

   Interactive elements on the website draw visitors in and improve their experience. Users can click on nations on the interactive map, which is hosted by the Bing Maps API, to obtain detailed AQI data. This interactive feature encourages active participation with the material presented in addition to making exploring easier. Meaningful interactions with

the data are possible for users, such as comparing the quality of the air in various locations or following changes over time.

Contribution

1. **Easy Access**

   Users can easily access real-time information about air quality with this website. No matter what device they are using, consumers can quickly and easily acquire the Air Quality Index (AQI) data they need thanks to the user-friendly interface and responsive design.

2. **Promote awareness**

   The site raises public awareness of air pollution by displaying accurate and up-to-date air quality information. It helps users understand current air quality conditions and potential health impacts in their area, encouraging proactive measures to reduce the risk of exposure to harmful pollutants.

3. **Accurate Information**

   The integration of the AQICN token and Bing Maps API ensures that the website provides accurate and reliable AQI data. Users can trust the information presented, making informed decisions based on the latest air quality readings.

4. **Health and Environmental Protection**

   The website is essential to preserving the environment and public health. It assists users in taking the appropriate safety measures during times of low air quality, such as donning masks or staying inside, by giving them access to timely data on air quality. Furthermore, this data can be utilized by health organizations and governments to create plans for environmental protection and better air quality.

Conclusion

In summary, AQIMY is a user-friendly, intuitive and strong interactive website which offer reliable and visualize information of Southeast Asia countries' AQI. Through real-time updates and intuitive visualization maps, users can easily view the air quality status of various countries and understand the potential impact of local air on health and the environment. The website's responsive design and user-friendly interface ensure that users can easily access and browse the required information regardless of the device they use. In addition, AQIMY is not limited to providing data, but also promotes public attention and understanding of air quality issues through prevention methods and related resources, making positive contributions to improving air quality.

Through AQIMY, tourists can learn about the air quality conditions of their destinations before traveling, residents can take appropriate precautions to protect their health, and national health organizations and other relevant departments can use this data to take effective measures to improve air quality. In short, AQIMY is committed to promoting health and sustainable development goals by providing accurate and easily accessible information to help users better understand and respond to air quality issues.

Appendixes

9.1 Navigation Bar

User can click to choose which part they want to view in the website.

Figure 9.1.1 Desktop screen navigation bar

Figure 9.1.2 Navigation bar with smaller screen size

9.2 Home page (AQIMY.html)

9.2.1 Introduction section

A brief introduction of the website.

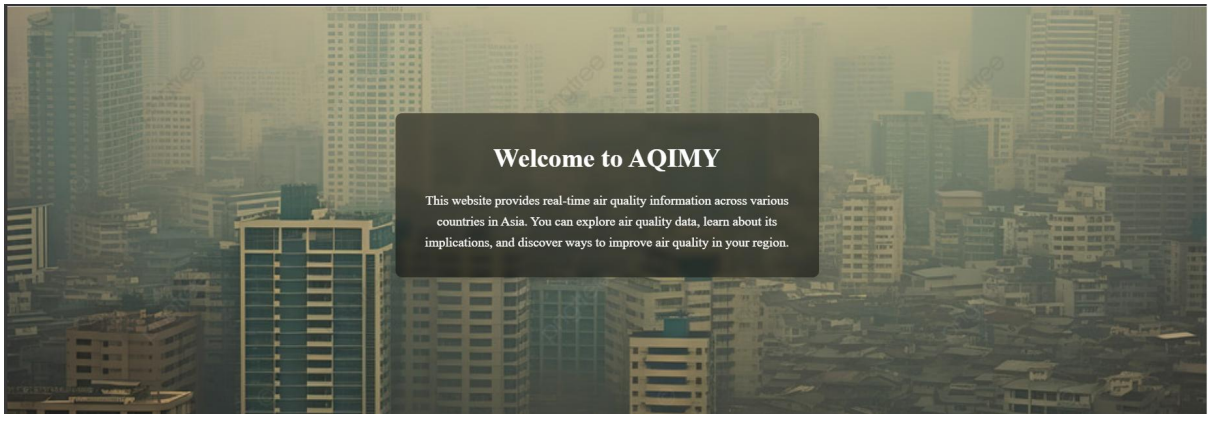


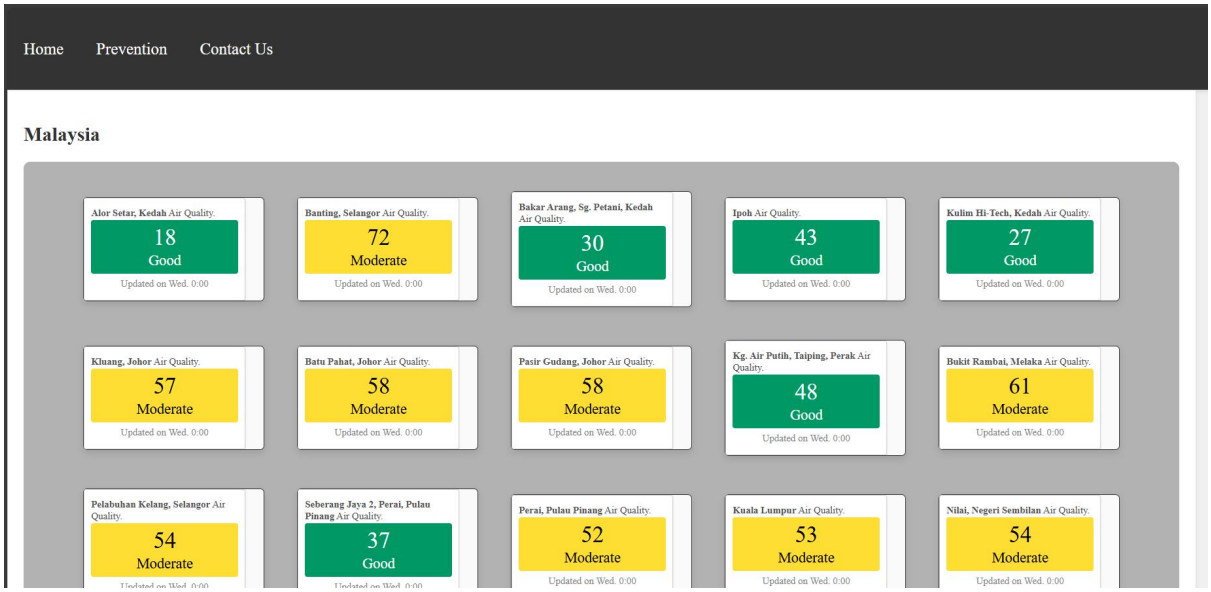
Figure 9.2.1 Introduce section in 'Home page'

9.2.2 Air Quality Index

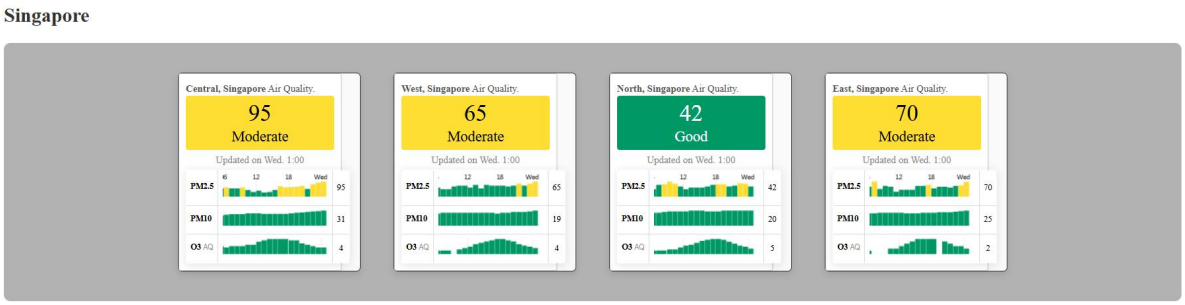
This section includes a interactive map and a drop-down country menu which allows user to choose and view the AQI of each country based on their preference.

9.2.2 Interactive map and drop-down country menu

AQI information will be shown in **country.html** when user click on the country.



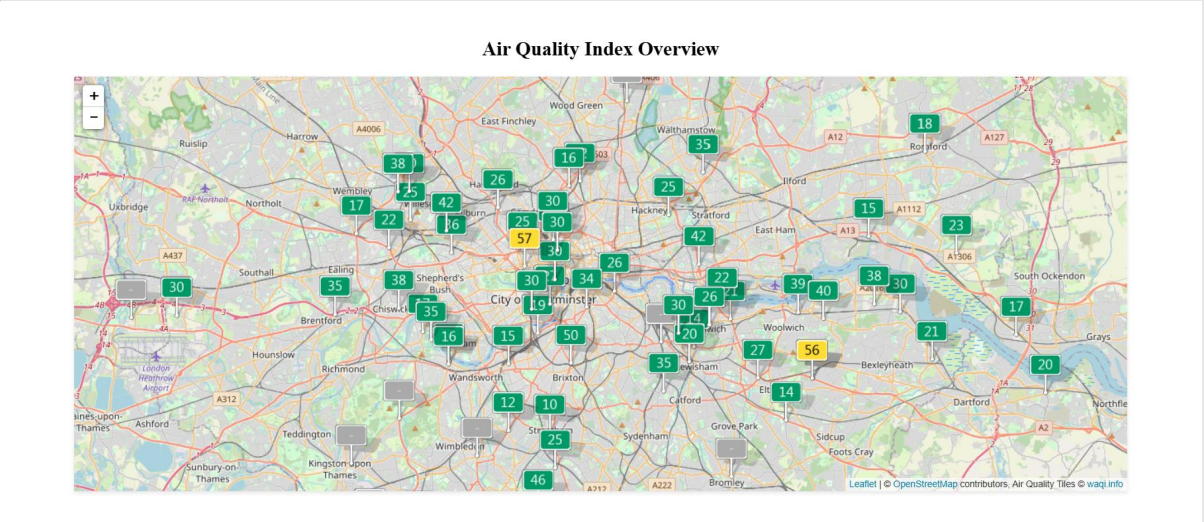
9.2.3 AQI widget



9.2.4 AQI widget with more details

9.2.3 Air Quality Index Overview

A global AQI map integrate with Leaflet allow users to have a clear visualisation on global air pollution status.



9.2.5 Integration with Leaflet

9.2.4 How to read AQI ?

A color-based table used to educate user on how to read the AQI.

How to Read Air Quality Index

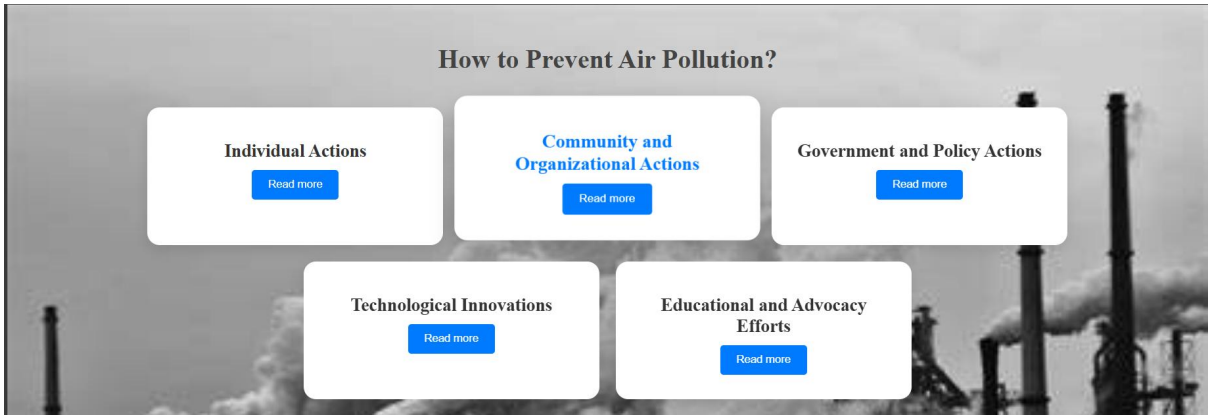
AQI	Air Pollution Level	Health Implications	Cautionary Statement (for PM2.5)
0 - 50	Good	Air quality is considered satisfactory, and air pollution poses little or no risk.	None
51 - 100	Moderate	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
101 - 150	Unhealthy for Sensitive Groups	Members of sensitive groups may experience health effects. The general public is not likely to be affected.	Active children and adults, and people with respiratory disease, such as asthma, should limit prolonged outdoor exertion.
151 - 200	Unhealthy	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.	Active children and adults, and people with respiratory disease, such as asthma, should avoid prolonged outdoor exertion; everyone else, especially children, should limit prolonged outdoor exertion.
201 - 300	Very Unhealthy	Health warnings of emergency conditions. The entire population is more likely to be affected.	Active children and adults, and people with respiratory disease, such as asthma, should avoid all outdoor exertion; everyone else, especially children, should limit outdoor exertion.
300+	Hazardous	Health alert: everyone may experience more serious health effects.	Everyone should avoid all outdoor exertion.

9.2.6 AQI table

9.3 Prevention page (prevention.html)

9.3.1 Prevention section

Provide some method which can effectively prevent air pollution.



9.3.1 Container with hover effect

9.3.2 Container when smaller screen size

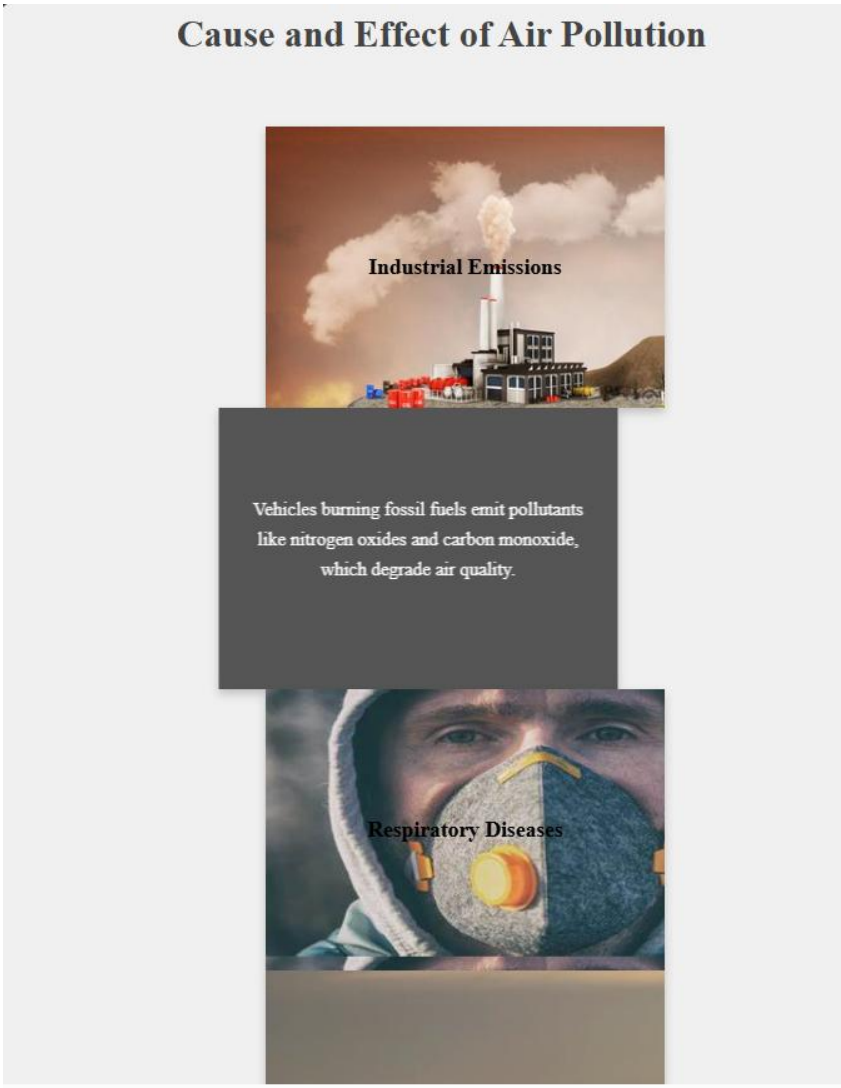
9.3.3 Container with method details

9.3.2 Cause and effect section

Provide some cause and effect to alert public on the disadvantages of air pollution.

9.3.4 Container with method details

9.3.4 Container when flipping

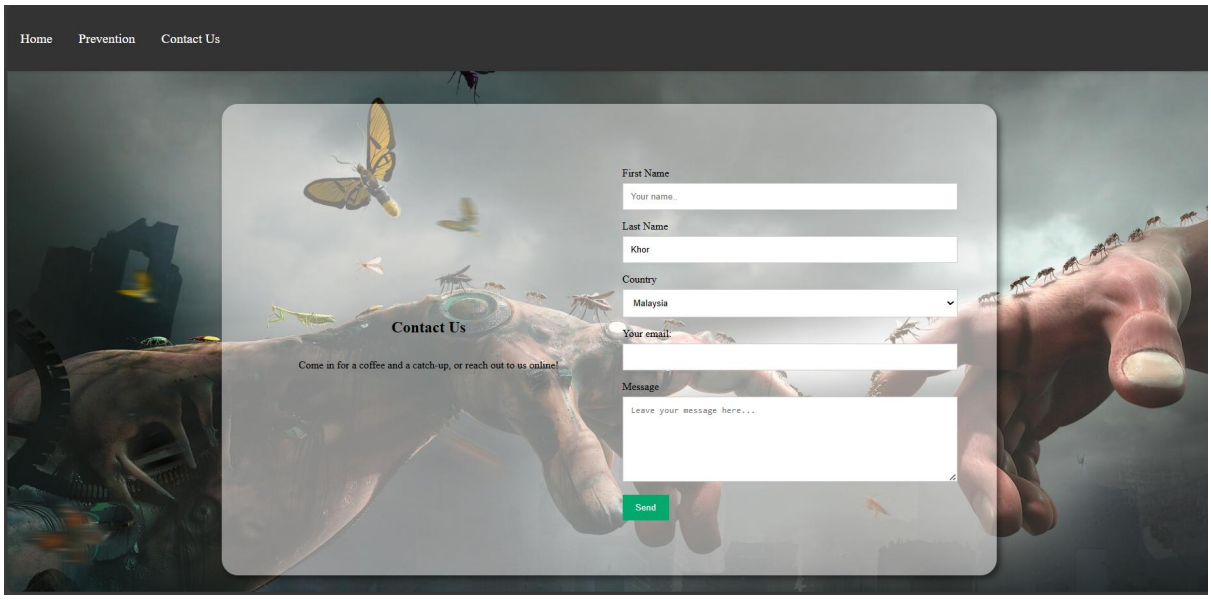


9.3.5 Container when smaller screen size

9.4 Contact us page (contactus.html)

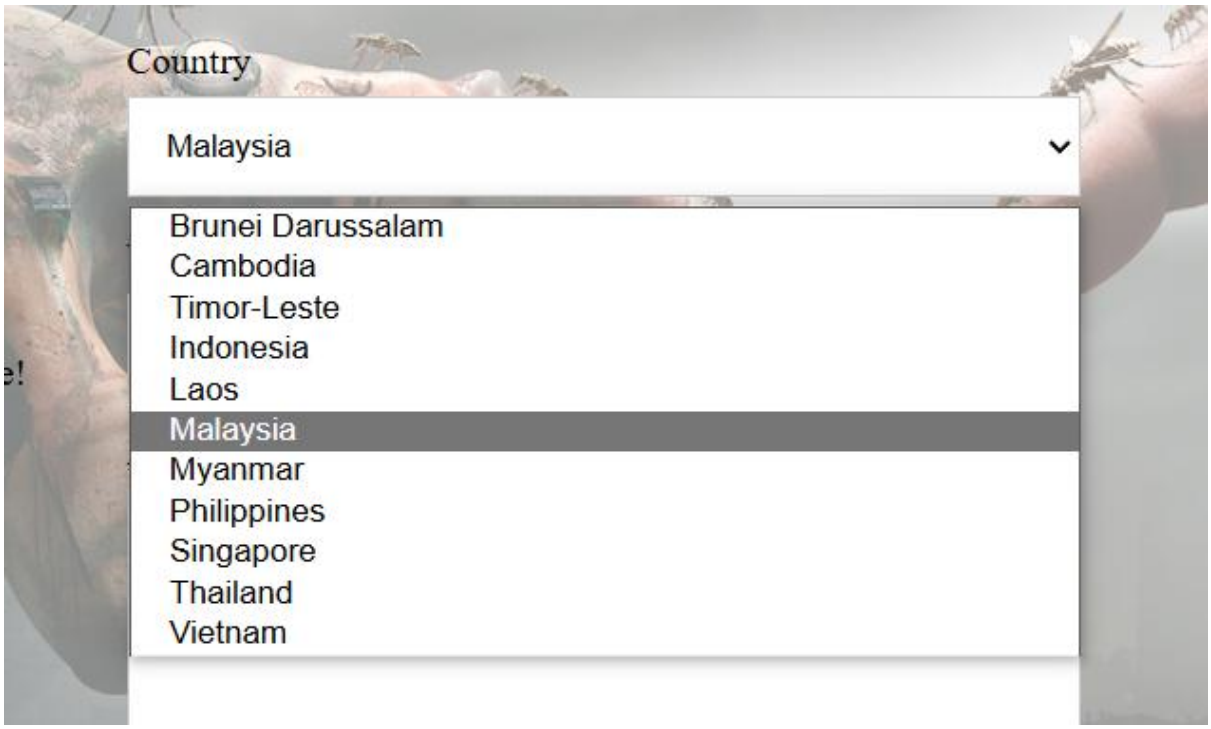
9.4.1 contact us section

To receive feedback from users.

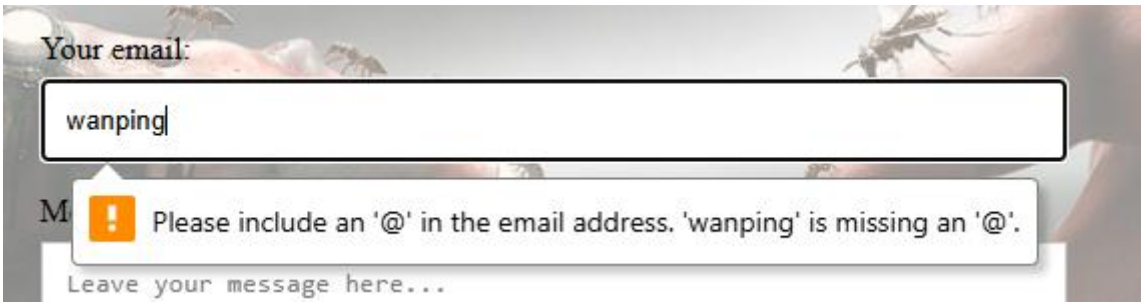


9.4.1 Contact us page

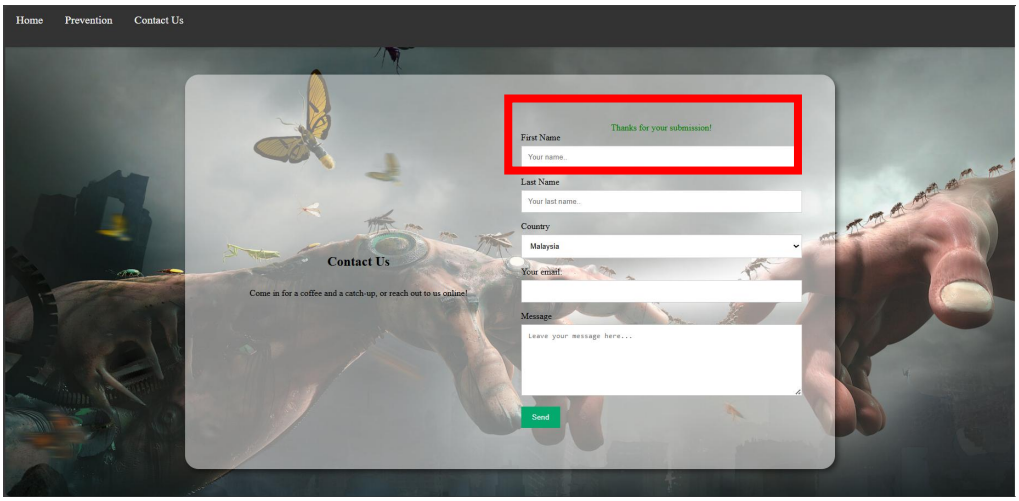
9.4.2 Reminder when empty input



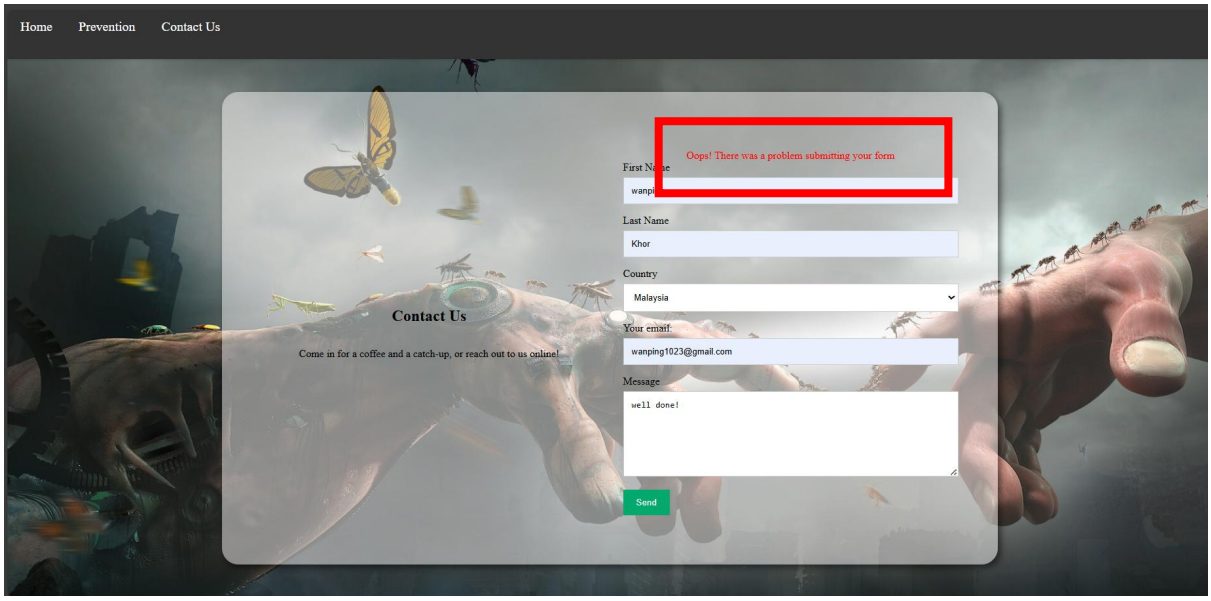
9.4.3 Drop-down menu in contact form



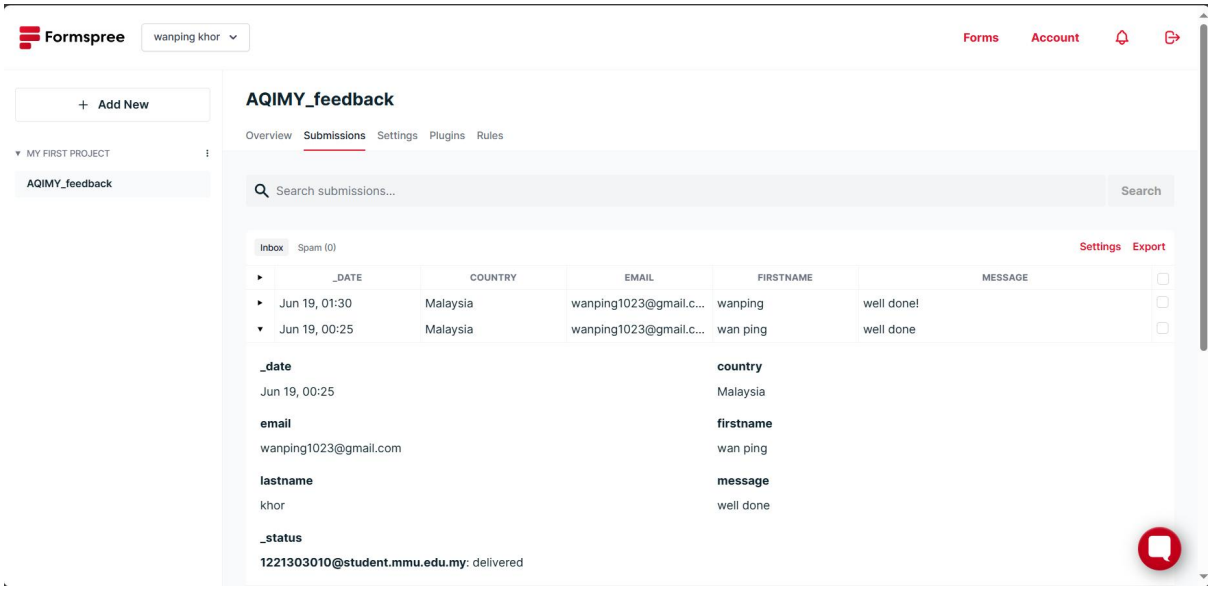
9.4.4 Reminder when incorrect input format



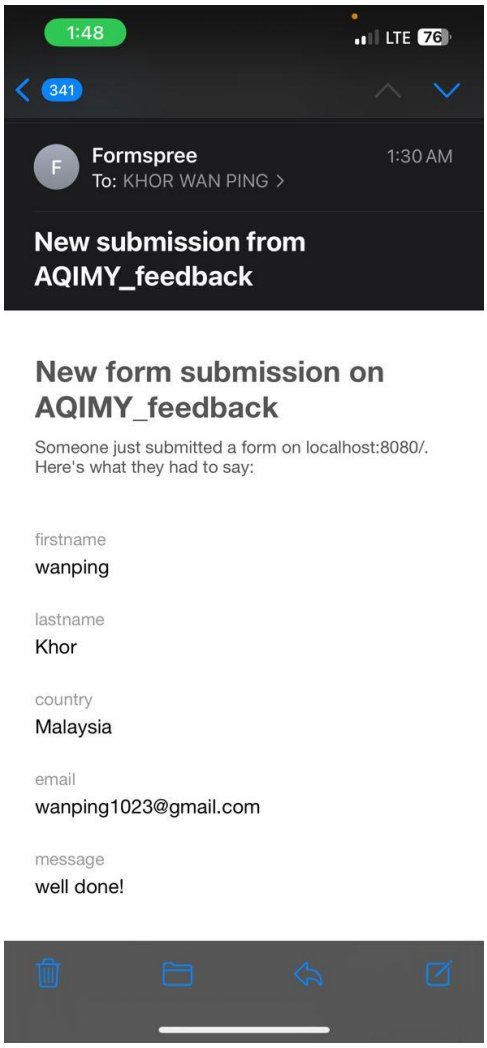
9.4.5 Contact form when successfully submitted



9.4.6 Contact form when fail to submit



9.4.7 Received feedback information in 'Formspree'



9.4.8 Received feedback information via email