1. **Related work**

The pressing issue of environmental degradation reminds us the importance of shifting to a healthier, greener and more sustainable lifestyle. IBM, the company with such a social responsibility, offers us an opportunity to participate in the environment preservation.

While the environmental needs is an obvious motivation for our project, we know habit formation plays a pivotal role in making a long-term difference in people’s behavior. According to psychological research, consistent actions over time, 21 days claimed by Maxwell Maltz in his 1960 self-help book Psycho-Cybernetics, lead to the establishment of habits, which can then become automatic responses to specific cues. Therefore, we enable people to integrate the eco-friendly advice into their routine, which can be grouped into three sections like daily, weekly and monthly according to their will. Technologies such as augmented reality (AR) offer innovative ways to encourage and monitor these habits, making the process both interactive and rewarding. We designed a main feature that users can plant virtual trees after completing routines created by themselves and collecting enough points. Actually, we got the idea from Ant Forest from Alipay.

Incentive system is also important. Research has shown that gamification—applying game-design elements in non-game contexts—can significantly enhance user engagement and motivation. Apple Fitness and its badge system is an excellent example in indicating the power of gamification.

Chatbots are computer programmes that can act like a human to answer questions in certain areas using artificial intelligence(AI). The application of chatbots have made great impacts across various fields. In the context of our project, the application of IBM watsonx chatbot is extremely helpful for several reasons. Firstly, it is personalized so that it can increase the likelihood the user would stick to these sustainable suggestions given by the chatbot. People can customize their own routine, which are habits they agree on. Secondly, it is conversational so that people can retain information through this dynamic and interactive process.

In a word, after conducting research on societal and market needs and investing in technical solutions and frameworks, we have defined the requirements for our AI and AR avatar product, that is a chatbot that can help people develop eco-friendly living habits by providing sustainable living suggestions and displaying incentives. And we choose to use Java, Spring Boot, and MyBatis Plus for the backend, Vue.js for the frontend, Redis and MySQL as the databases, Nginx to proxy the frontend and backend, WebSocket to enable communication between the client and server, AR.js for web AR, Postman and Junit for testing, and AWS for deploying our project to the cloud. This combination is considered to be one of the most mature and common technical solutions in the industry.

1. **Existing Solutions** 
   1. **Alipay Ant Forest**

Alipay ant forest is of close relevance due to it’s similar purpose of using digital technology to promote environment protection. It’s integrated into the company’s mobile app, rewarding its users with green energy points when they accomplish a low-carbon activity like riding a bike to work, going for clean energy or turning to second hand clothes. It’s such a successful and instructive project because it has garnered the attention of over 500 million users and successfully planted 100 million real trees in Northwest China.

Persuasion systems like Ant Forest give us inspiration on methodologies and theories on how to implement our own project. Motivation theory is the main theory adopted by Ant Forest. Motivated behavior should be seen as a means through which various needs can be expressed or fulfilled. Ant Forest hold tight to this psychological mechanism by emphasizing environmental accomplishments for extrinsic motivation and social interaction and entertainment for intrinsic motivation.

Its design and human-computer interaction logic is much more complicated than our project, but design insights can still be drawn from Ant Forest, including layout, aesthetic features, data display and virtual tree planting logic.

* 1. **Forest**

Forest is another app that helps refine idea of our project. It’s also an habit formation app that help people put down their phone and focus on the important things of life by entering Forest app, staying away from other apps of the phone and planting a virtual tree. If the user leaves Forest, the tree dies. It’s so interesting that we know that it is imperative to make our website playful and fun, only in this way can we attract more users to our website.

* 1. **Apple Fitness**

Apple Fitness uses a variety of rewards and incentives to maintain user motivation. Its badge system which is related to the “Apple Watch Challenge” give us the deepest impression and inspiration. Users can earn unique badges upon completing specific fitness challenges. The achievement badges offer a clever yet simple way to engage with the interface. They can be awarded for consistency, task completion, social interaction and etc. , which cleverly introduces the software's values and evaluation system, guiding and inspiring users in their engagement. This also serves as the foundational model for our website's badge system.

* 1. **ChatGPT**

ChatGPT is a chatbot and virtual assistant developed by OpenAI，whose capabilities have been widely recognized and from which many have greatly benefited. Its spectacular ability to understand and generate human text made us wonder how convenient it would be if we have a particular chatbot for shaping people to be earth protectors. ChatGPT provided a valuable reference point for developing our chatbot which is focusing on the natural language processing capabilities of the chatbot. All in all, ChatGPT charted a clear direction for us to explore the given chatbot framework IBM watson Assitant.