

Design Principles of Sustainable Website Powered by Solar Energy

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Abstract: The present paper addresses the design of a sustainable green hosting website powered by solar energy as a type of renewable energy. Two websites are designed: a static website with a carbon dioxide-free address and a dynamic website with an organic address. The server used in the design process uses solar energy as a source of electricity.

Keywords: Sustainable website, green host, Design principles of sustainable website, Sustainable energy, Solar power.

1 Introduction

The green hosting website works in a sustainably manner over a long time without damaging itself or the environment. The Internet must be sustainable and increasingly accessible to the public [1]. Objectives "green" data that occur in discussions of hardware development strategies, portables, referred to as sustainability, usually explains the transition from paper to bits (make no sense). It is used to justify the high-level design and development decisions as well as to meet the requirements of sustainable design web users without compromising the ability to meet the needs of those at risk in the future [2].

Green technologies include green

hosting to reduce the environmental impact. They have participated in the hosting plans for everyone, from beginners to large companies. One can reduce the environmental impact by using the use of low-voltage computers, increasing the active cooling air outside during moderate weather, updating computer room conditioners, and buying renewable energy credits [3].

Principles of Green Web Design To make the WordPress website greener and less taxing on the environment, the designer recommends the following principles [4].

- Choosing the right web host.
- Obtaining the required energy from renewable energy sources.

- Choosing an eco-friendly website design.
- Having easily printed content.
- Improving the site speed.
- Educating web visitors.

Sustainable energy

The term "sustainable energy" denotes a form of energy that meets our current needs of energy without the risk of expiration or depletion.

We must promote sustainable energy on a large scale because it does not harm the environment. It is also available on a wide range of free services [5]. Sustainable development must address the needs of the present without compromising the ability of future generations to meet their needs. Sustainability involves four key elements about energy, the ability to increase energy supply, energy efficiency and conservation, public health and safety, protection of the biosphere and prevention of pollution. Sustainable energy is based on the environment (the production of hazardous waste and toxic emissions), economy (whether energy gives people a consistent and reliable way), and society (energy security with the availability of long-term energy). Sustainable development includes the environment, economy, politics and culture [6].

Sources of sustainable energy involve solar power, solar heating, wind power, hydropower, biomass, biofuels, as well as geothermal and marine energy.

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2 Methodologies

Static and dynamic websites will be designed in the present paper, as follows:

1. The application of the principles of sustainable websites design.
2. Choose the appropriate server for the site designer.
3. The processing plant to generates solar power for a server electric power.
4. Dynamic and static websites design.

The designer can use the desired images only to reduce the precision and quality as much as possible. Then, he/she can use a tool like or Tiny PNG WP Smush Pro before uploading to the site [7].

- Be strategic with video clips.
- Designer needs to restrict video clips only to a suitable location with low accuracy. It must include video clips and direct access to the website and should not be tuned for automatic operation.
- Web caching setup.
- Cache download comprises elements of the shared page, such as JavaScript, CSS, and images. When the user revisits the page, you can retrieve the data from the memory location cache instead of querying the webserver again [8].
- Delete what you do not need.

Anything that is not used on the website, such as old publications reviews, unused media, categories, tags, comments, spam and broken links, should be cleaned periodically.

- Improve site navigation information to facilitate identification.

A site with an unclear navigation structure will confuse and annoy the users and increase the time they spend to find the required information [9].

- Choose a green web host.

Green web hosting is still in its beginning and attempting to find a host that combines solid performance, good customer support. Using renewable energy represents a challenge, as well.

2.1 Server Selection

The user can define a server to run the website, a website for another number of users, file servers, print servers, application servers, domain servers, system names, mail servers, web servers, virtual servers, proxy servers, servers monitoring and management types [10].

Web servers

A Web server is a computer that runs websites. This server is always connected to the Internet. Every web server connected to the Internet is given a unique address consisting of four digits ranging from 0 to 255 and separated by periods. The IP address of the webserver that will host the site must be specified in the web address or domain name (for example, tutorialspoint.com). the dedicated Servers can be uploaded by the designer to assist his/her web-based operations [11]. Web servers are four: Apache, IIS, LIGHTTPD and JAGSAW.

Apache HTTP Server

The Software Foundation is the Apache Web server. Its free software can be installed on any virtually operating system, including Linux, Unix, web page, FreeBSD and Mac OS X. In the present paper, we deploy Apache website designer [12].

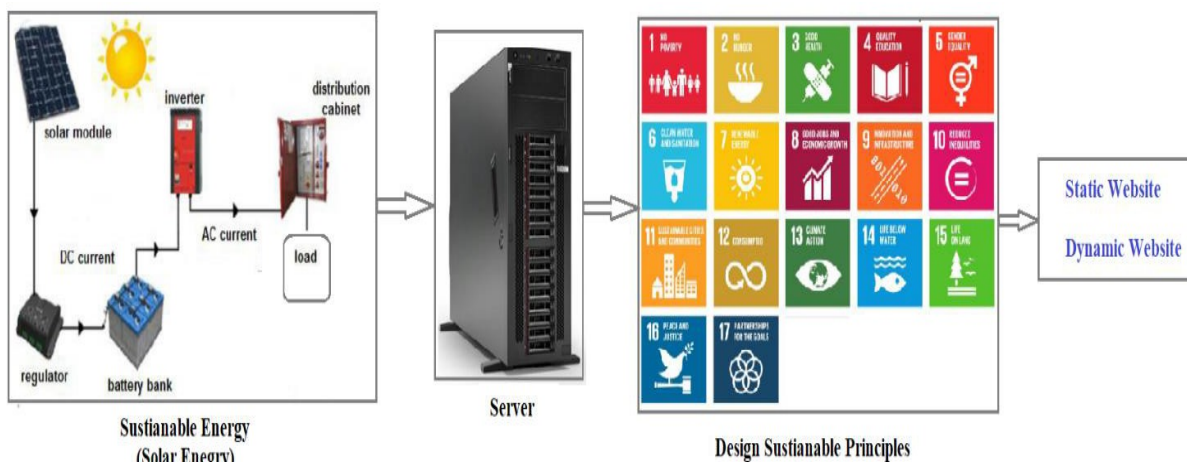


Fig. 1: Flow Chart of Website Design

2.2 Solar power

Solar energy is the conversion of sunlight into electricity using photovoltaic (PV). PV cells are initially used only as a source of electricity for small and medium-sized applications. PV solar energy has become a fast cost-effective way. Solar panels (photovoltaic cells) combine sunlight, generate direct current power (DC), then use inverter technology to turn it into AC power usable (AC). Then, AC power flows by the electrical panel of the server. The remaining energy is stored in a rechargeable battery for use at night [13].

2.3 Design Static and Dynamic Websites

After the completion of the course setup for the design of the site as the final step, start the design step. It produces a set of web pages in a single web server, such as wikipedia.org and google.com and amazon.com [14]. Some websites are static, while others are dynamic. In our work, we have fixed and dynamic web design as an example of sustainable websites that use renewable energy (solar energy) as a server. Table (1) shows the difference between static and dynamic websites.

Table 1: Different between Static and Dynamic Websites

Features	Static Website	Dynamic Website
Definition	Static websites are generally simple HTML written pages that serve as responses from browser to server in which all the information and data are static and never change automatically.	Dynamic websites are the pages written in some more complex language, such as ASP.NET, in which data is rendered after some interpretation and capacity to produce distinctive content for different calls.
Complexity	Data in static websites are static and do not require any interpretation before rendering, so static websites are simple.	Dynamic websites do the interpretation process, which makes data dynamic in nature. Thus, dynamic websites become complex.
Language used	Static websites are generally written in simple languages, HTML, JavaScript, CSS, ...etc.	CGI, AJAX, ASP, ASP.NET, and more complicated languages are used to create dynamic web pages.
Rendered Data	Data do not change until someone changes it manually, so data is static.	Data is first interoperating at server side, so it does not remain the same on every call, which makes data dynamic.
Time	Static websites take less time to get loaded.	Dynamic websites take more time than static web pages.
Database	Static websites do not involve database for data redecoration.	Dynamic websites use databases for data redecoration.

2.3.1 Static Website

Page website is an introduction page that displays the same content to all users and is created using HTML code to produce documents and files stored in the file system and available by the web server through HTTP [16]. Website is suitable for hard content that does not require an update or may be rarely updated, but the modern web templates systems work on this change. The code runs golf bundled source on the Internet [17]. The advantages of hard website

involve improved security and performance to end-users, lack of need for systems such as databases or other applications servers and cost-saving rather than use of the hosted environment [18, and 19]. In the present work, the website design (free of CO₂) has been fixed as an example of a sustainable full website. Static website cabbage on a web page to explain the purpose of the website, how it works and how the user can connect to it as shown in Figure 2 (a, b, c).



This Website is tottaly Sustainable

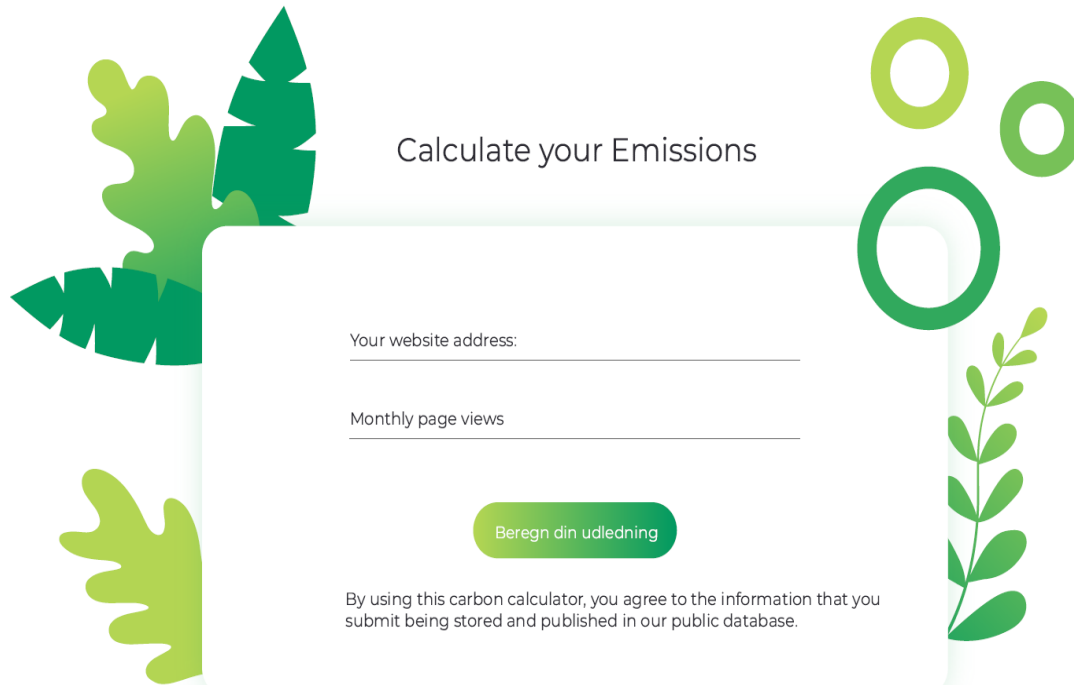
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[Start Now](#)

or

[Read More](#)

(a) Home Web page

The form is titled 'Calculate your Emissions' and is surrounded by green leaf and circle graphics. It contains two input fields: 'Your website address:' and 'Monthly page views'. Below these is a green button labeled 'Beregn din udledning'. At the bottom, there is a disclaimer: 'By using this carbon calculator, you agree to the information that you submit being stored and published in our public database.'



● About Project

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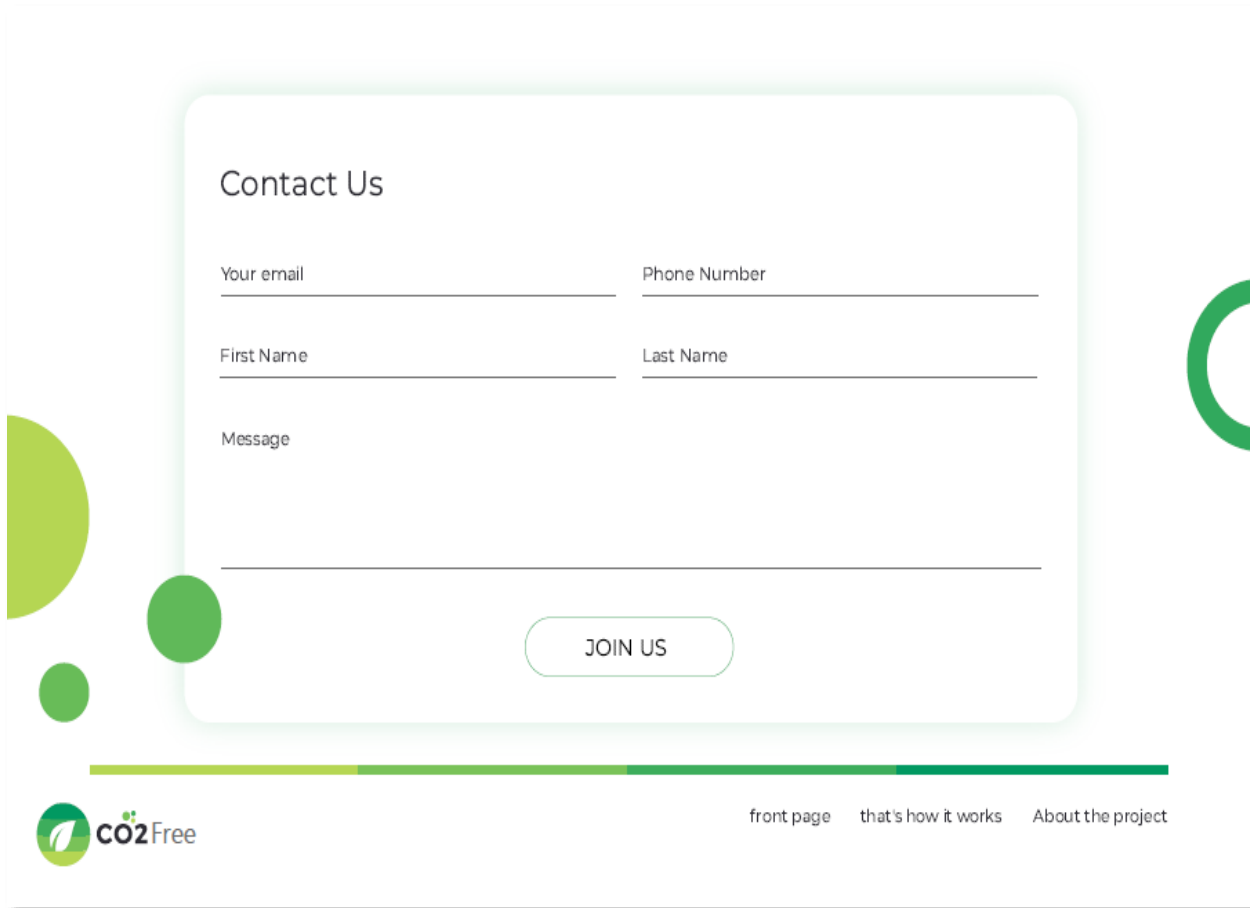
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(b) How Website Works



The image shows a 'Contact Us' web form. It has a title 'Contact Us' at the top. Below the title are four input fields: 'Your email', 'Phone Number', 'First Name', and 'Last Name'. Below these is a larger 'Message' input area. At the bottom of the form is a 'JOIN US' button. The form is set against a light green background with decorative green circles. At the bottom of the page, there is a horizontal bar with the 'CO2Free' logo on the left and navigation links 'front page', 'that's how it works', and 'About the project' on the right.

(c) Contact us Web page

Fig. 2: Web pages of Static Website.

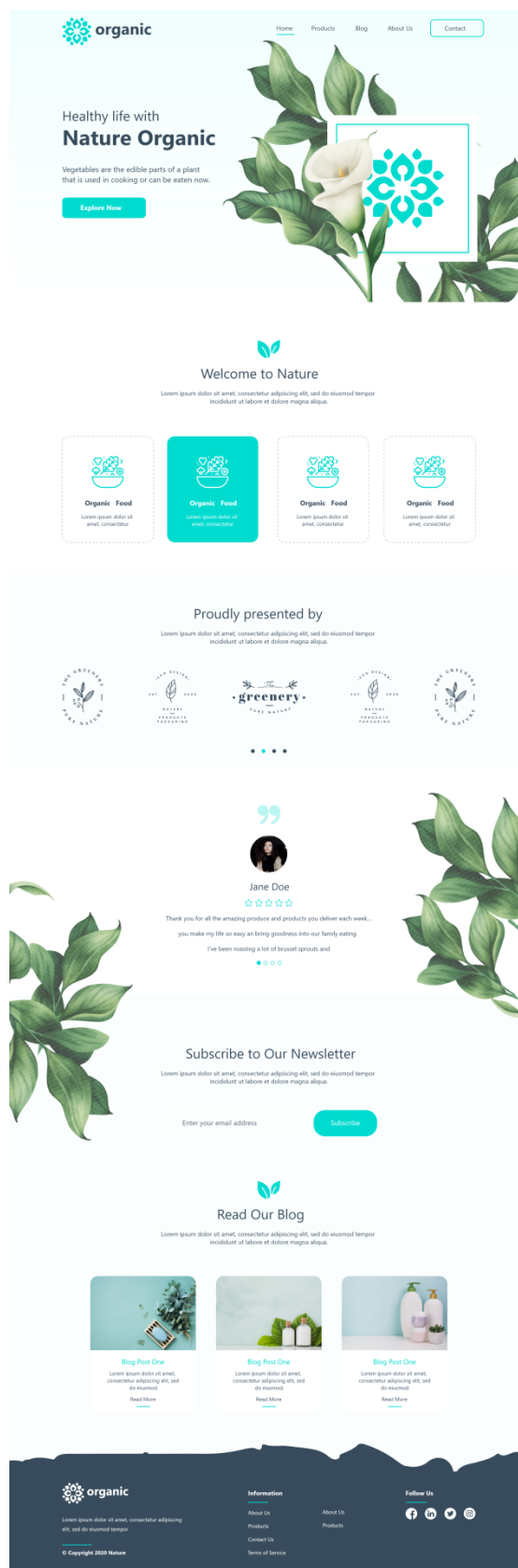
2.3.2 Dynamic Website

When the site contains dynamic pages, such as templates, contents, and scripts to display various content types of every time; as well as changing pages with the reader, it will be a dynamic website. Client- Side scripting a dynamic website is the site that uses HTML scripting running in the browser as it loads where the same client-side techniques can dynamically update the DOM in the same way. The assembly of every new web page is managed by an application server that processes server-side scripts, where the parameters govern how the assembly of each new web page continues, including the setup of further client-side processing. [20].

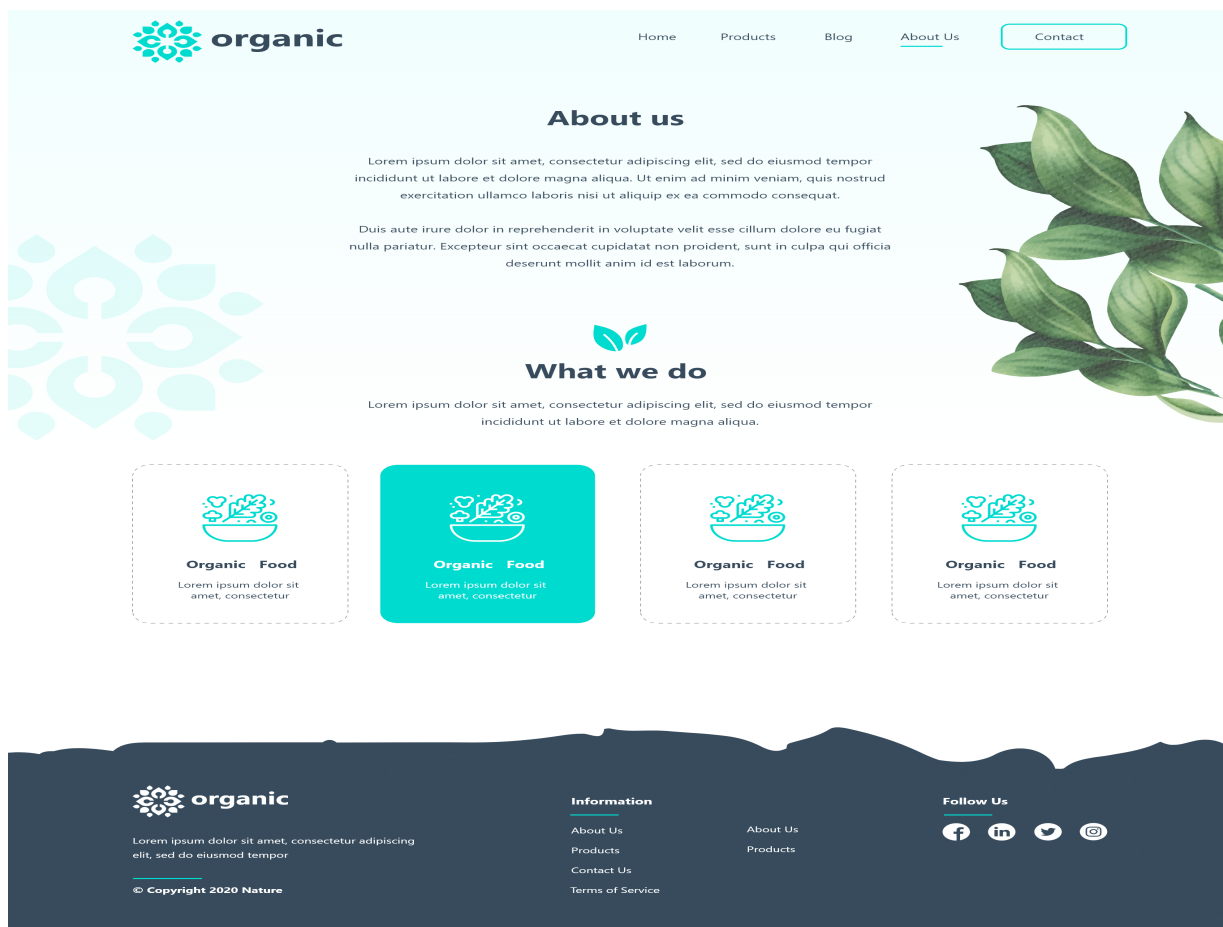
To create variable content, either server-side or client or a combination of the two is used for dynamic website

scripting. These sites also include infrastructure for programming HTML. Take care of scripting by the client site.

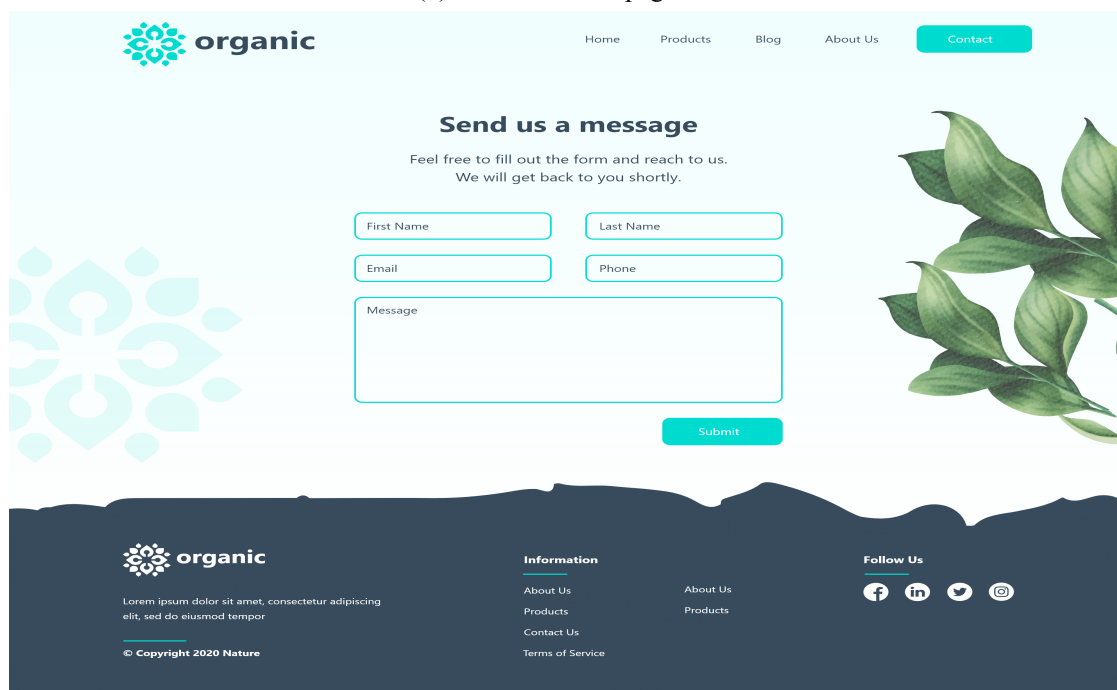
Using HTML format scripting from the client-side, a page can use JavaScript, PHP, or another programming language to change the page data as dynamically created. Scripts run on the server that hosts the page with the scripting of the server-side. The process defines how to create a page through the parameters specified in the scripting of the server-side. Figure 3 (a, b, c, d, e) shows the web page of this dynamic website. Organic Life or Health with Nature Organic is the name of the website with the main web page as shown in Figure 3: (a) Introductory web page on the website is shown in Figure 3 (b). Contact us, products and the web page of the code are shown in Figures (c) and (d) and (e), respectively.



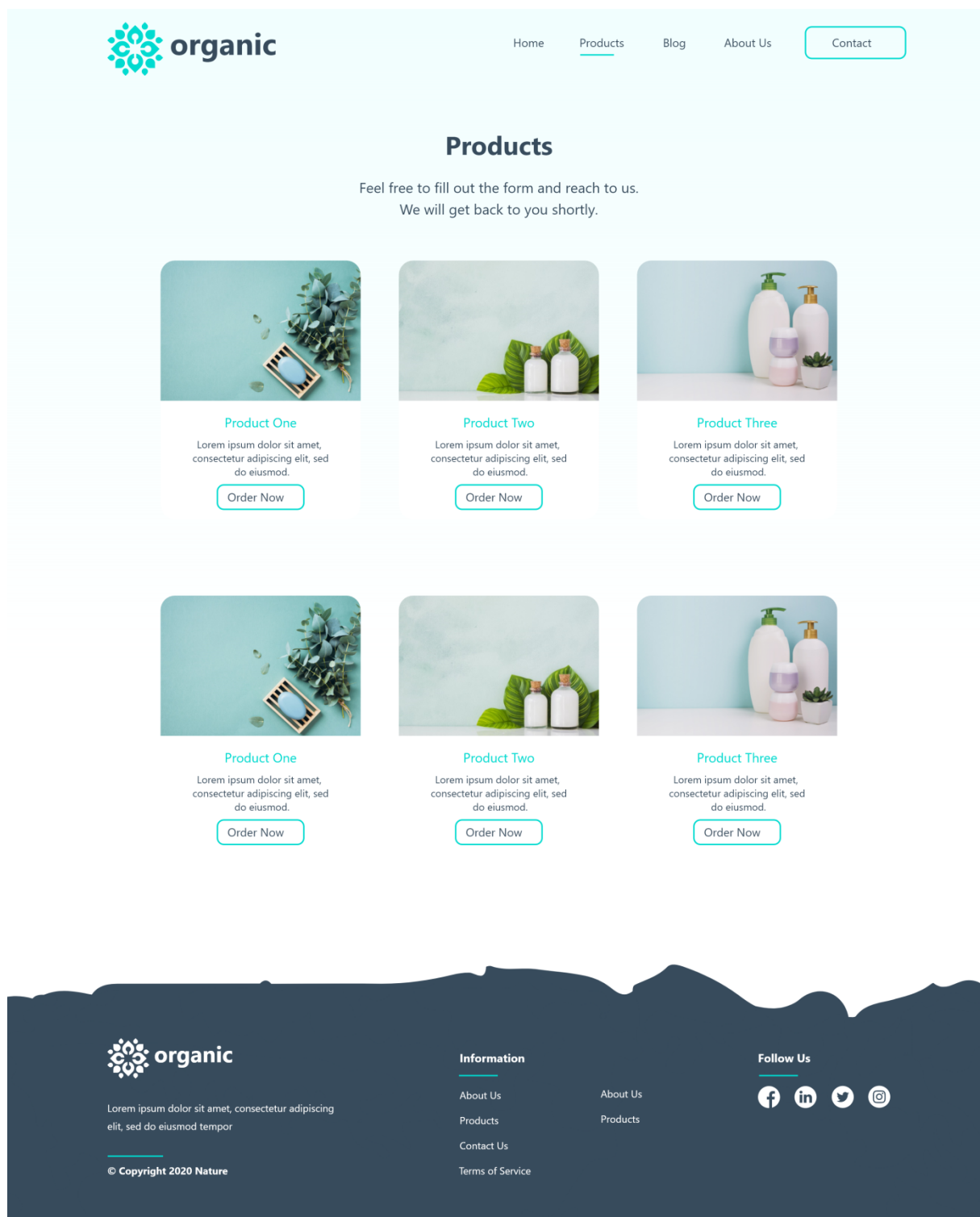
(a) Home Web page



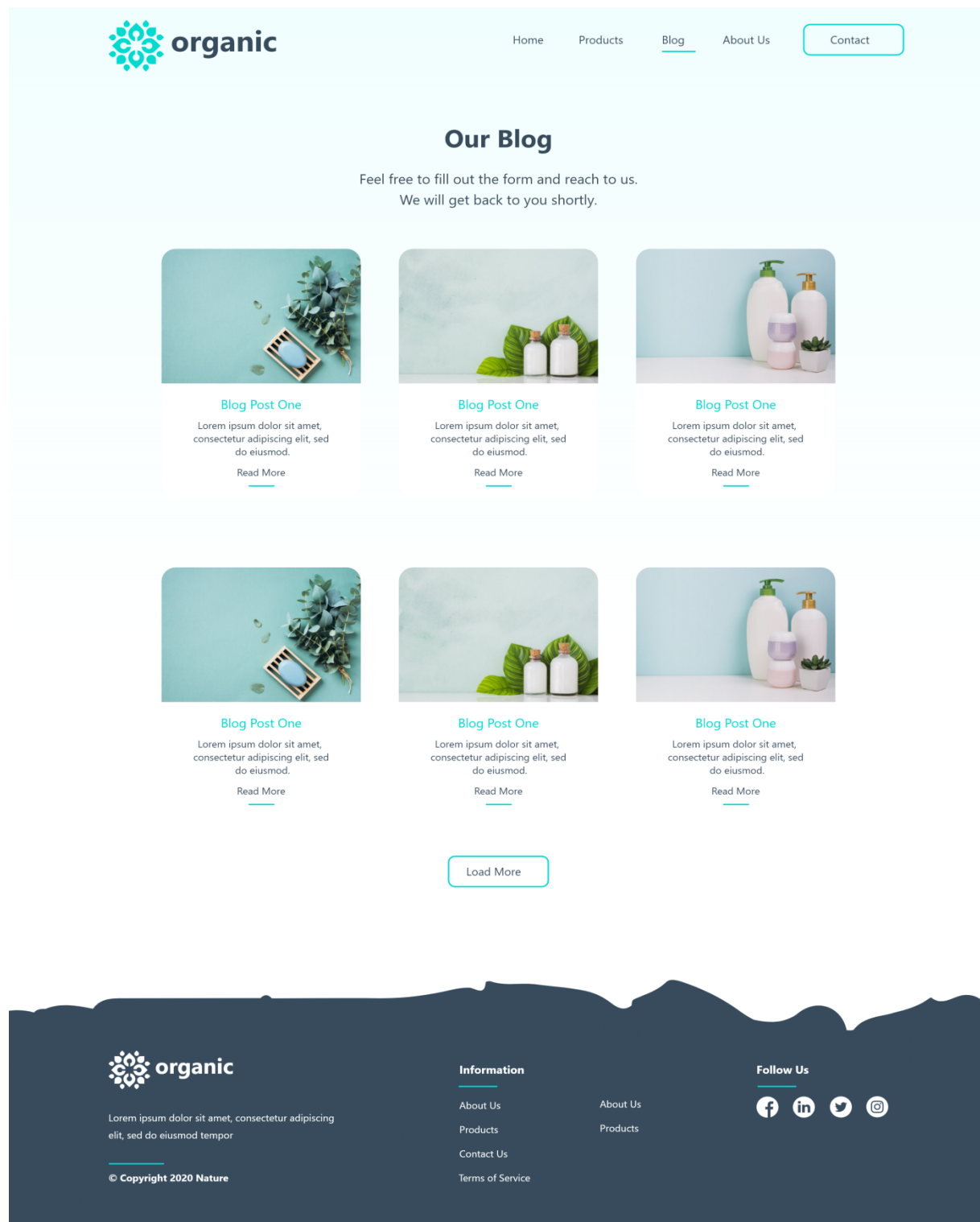
(b) About us Web page.



(c) Contact us Web page



(d) Products Web page



(e) Our Blog Web page
Fig.3: Web page of Dynamic Website

Conclusions

The present paper addressed the design of the solar-powered sustainable website as a type of renewable energy. Two websites were designed: a static website with a carbon dioxide-free address and a dynamic website with an organic address. The server used in the design process uses solar energy as a source of electricity. Performance of the server and speed of web during all design steps mean renewable energy efficiency in the web design that produces sustainable clean and green energy sources.

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Conflict of interest: The authors declare that there is no conflict regarding the publication of this paper.

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