



# Cloud Technology in Sustainable Development of Ecology

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**Abstract:** One of the most important social issues of the day is the need for sustainable development. Information and communication technology (ICT) is a worldwide trend that has important consequences for sustainable development. This study provides a conceptual framework of the positive and negative links between cloud computing and sustainability in order to better grasp the idea. Reduced power usage in an organization's Information and Communication Technology (ICT) department may be achieved via the use of cloud computing. Cloud computing may be utilized as a tool for sustainable growth and improvement of our everyday lives. This notion of sustainability will help any firm use ICT in a more effective manner because they will only have to spend money on services that are needed on an as-needed basis, and the company and its consumers will save money.


## 1 INTRODUCTION


According to World Bank research, increasing energy efficiency benefits the economy as well as the environment. “Development that fulfils current demands without jeopardizing future generations' capacity to satisfy their own needs” is defined as sustainable development. In the words of the World Commission on Environment and Development Ecological, social, and economic advancement are all possible within the boundaries of our planet's natural resources, according to sustainable development. Everything in the world is interconnected in terms of geography, time, and quality of life when it comes to sustainable development (Indrawati, 2015). One of the most significant technological shifts that have occurred in the IT sector in the last decade has been cloud computing. It was impossible to imagine 10 years ago that cloud storage and non-native apps would be commonplace today. Companies and academic institutions are gradually migrating their computer requirements to the cloud. As a result of the use of cloud computing services and technology, capital investment and carbon footprint will be reduced, which underscores the necessity of sustainable corporate responsibility.

## 2 MATERIALS AND METHODS

Ecological issues, as well as clouds, Cloud computing, when used with other technologies like grid computing, digital ecosystems, and green computing, may be able to help make distributed computing more sustainable in an ecological environment. People who use grid computing make a computer network that looks like a supercomputer out of many networked computers that can do a lot of work at the same time (Costanza, 1994). As a sociotechnical system, a digital ecosystem has to be able to self-organize and be able to grow and last for years. It is the goal to make network-based economies possible by expanding service-oriented architectures (SOA). Ecologically sound and socially responsible computer practices are part of “green” computer practices, too. Three main principles: “Peaceful coexistence in a healthy environment” is one of them.

Environmental, social and economic sustainability might be improved if we build a green infrastructure it's possible that the installation of this infrastructure will serve to enhance the health benefits of landscape components that interact with natural processes to keep people healthy. Several business models have been developed to ensure the long-term

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viability of cloud computing. The cloud cube model, which allows organizations to work together in cloud formations for particular business requirements, and the hexagon model, which identifies six essential criteria for corporate sustainability, are two instances of this. The usage of public cloud computing may aid in the creation of new value chains and the improvement of existing ones.

When there are ongoing problems with the environment, social, and economic aspects of life, sustainability is very important. We can use cloud computing in every part of sustainability (social, commercial, and environmental). As a result of new technology, small businesses now have access to a lot of computer space, giving them an advantage over their rivals. In order to meet environmental standards, cloud technology might be made to fit our needs. Dynamic resource provisioning, multitenancy, server consumption, and data center power efficiency are all provided by this software. It also allows many businesses to use the same infrastructure. Future efforts to be more environmentally friendly could be very affected by new technology. The government wants to do more research on the environment, make emergency response systems better, and use climate change prevention measures (Carlsson, 1991).

When it comes to green IT, cloud computing is an example. As defined by Jenkin et al., the term «green ITs» refers to IT systems that help companies achieve environmental sustainability (Jenkin et al., 2011). When we talk about “sustainability”, we're referring to the equitable distribution of resources throughout current and future generations as well as amongst the individuals who make up the current generation (Costanza, 1994). Ecological sustainability is the preservation of a planet's capacity to sustain human existence. Only by making the right choices will this be possible. There is a lengthy history of environmental sustainability. 1972 was the first major meeting on environmental sustainability, the Stockholm Meeting for the Human Environment. The United Nations Framework Convention on Climate Change was held in Rio de Janeiro in 1992. Rio was the host city (UNFCCC). The Kyoto Protocol, which legally binds 37 industrialized countries to certain commitments, was signed in 1997.

Fundamental alterations in manufacturing are required if environmental sustainability is to be achieved. The growth of technical systems, particularly the development of new technological systems, is the driving force behind these developments. It is not only new technologies that determine the pace at which technology changes; it is also the rivalry among current innovation systems. A

definition of technical systems is needed to comprehend innovative systems. Interactions between economic and industrial actors within a certain institutional framework are what make up technological systems. These systems facilitate the invention of new technology (Carlsson, 1991). Sustainability can only be realized via the deployment of innovative technological methods. In order to be long-term sustainable, they may be required to use technologies like those that manage resources in such a way that performance and power are maximized. They also make it possible for research programs to make better use of the world's energy resources. To achieve environmental sustainability, IT development must be evidence-based rather than management and policy-oriented, according to Watson (Watson et al., 2010).

### 3 RESULTS AND DISCUSSION

The use of social networks may also contribute to social sustainability. Using cloud platforms or cloud apps, this sort of network may be used in social networks. For sustainable development communities, the introduction of social networking sites has made it simpler and less costly to create new communities (Rafiq et al., 2022). Examples of social networking sites that promote social-ecological sustainability efforts include Taking IT Global, UnLtd, and Individuals for Earth. People for Earth is a social network that offers advice on how people may lead more ecologically responsible lifestyles.

Some Thoughts on the Future of Cloud Computing Sustainability is critical in light of ongoing environmental, social, and economic challenges. It's possible to use cloud computing for all facets of sustainability (social, commercial, environmental). Small companies now have greater access to massive processing capacity because of features like data sharing that were previously only available to large corporations. The capabilities of the cloud may be tailored to suit the needs of a more environmentally friendly future. It provides dynamic resource provisioning, multitenancy, server utilization, and data center power efficiency. In a variety of domains, the technology offers enormous potential for defining sustainability. It encourages environmental research, emergency response system development, and the adoption of climate change prevention measures, to name just a few.

Cloud computing's energy efficiency, on the other hand, is a source of considerable controversy. It will need a huge amount of energy to send a large amount

of data through the network. As an added benefit, VM consolidation may lower the number of active servers, but at the expense of placing more stress on a select few, whose heat distribution might become problematic. It is possible to create a framework that considers these issues. For example, a middleware green broker oversees the selection of the greenest cloud provider to deliver user requests in such a framework (Wall et al., 2021).

Cloud computing with sustainable development of ecology allows small businesses to get a lot of computing power without hurting the environment, which makes them more competitive with bigger businesses. This was the focus of this paper's research. Cloud computing technology can also help third-country countries because they will be able to get IT services that they couldn't get before because they didn't have enough infrastructure (Ioannou et al., 2017). Cloud computing speeds things up in the business world because it gives users faster access to hardware resources without having to spend money upfront. In this case, no capital costs are paid. Instead, only operating costs are paid. Cloud computing makes it possible to make new and innovative applications, like real-time, location-aware, environment- and context-aware mobile interactive apps, parallel batch processing, and business analytics, possible. These new and innovative applications are all made possible by the cloud computing model.

## 4 CONCLUSIONS

Cloud computing is an essential part in ensuring the long-term sustainability of ecology. Increasing competition in the marketplace, academic research, and the expansion of small businesses are all encouraged by this policy. Government agencies have been integrating technology into their existing infrastructure in recent years, and social media platforms have gained widespread acceptance. According to experts, cloud computing has the potential to have a significant impact on the environment in the future. In the event of a natural catastrophe or an environmental crisis, emergency response systems may be quickly deployed and maintained using cloud computing. Social networking platforms may be used for a variety of purposes, including the creation of environmental awareness-raising teams and the broadcast of information that might be useful in the event of an environmental emergency. In order to fully comprehend the energy efficiency provided by this

specific technology, further research must be done in the future.

## REFERENCES

- Indrawati, M., 2015. Energy and Sustainable Development: What's Next? *The World Bank*. <https://www.worldbank.org/en/news/speech/2015/06/10/energy-and-sustainable-development-whats-next>.
- Costanza, R., 1994. Chapter 24: three general policies to achieve sustainability. *Investing in Natural Capital*. Island Press, Washington, DC.
- Carlsson, B., Stankiewicz, R., 1991. On the nature, function and composition of technological systems. *J. Evol. Econ.* 1(2). pp. 93–118.
- Jenkin, T. A., Webster, J., McShane, L., 2011. An agenda for 'Green' information technology and systems research. *Inf. Organ.* 21(1). pp. 17–40.
- Watson, R. T., Boudreau, M.-C., Chen, A. J., 2010. Information systems and environmentally sustainable development: energy informatics and new directions for the IS community. *MIS Quart.* 34(1). pp. 23–38.
- Rafiq, M., Akbar, A., Maqbool, S., Sokolová, M., Haider, S. A., Naz, S., Danish, S. M., 2022. Corporate Risk Tolerance and Acceptability towards Sustainable Energy Transition. *Energies*. 15(2):459. pp. 1-19.
- Wall, W. P., Khalid, B., Urbański, M., Kot, M., 2021. Factors Influencing Consumer's Adoption of Renewable Energy. *Energies*. 14(17):5420. pp. 1-19.
- Ioannou, A., Angus, A., Brennan, F., 2017. Risk-based methods for sustainable energy system planning: A review. *Renewable and Sustainable Energy Reviews*. 74. pp. 602-615.