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# EARTH



December 2023

- Lessening the blow of climate-related loss and damage
- 3D Printed Houses and Disaster Management

Read on to learn more.



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## Lessening the blow of climate-related loss and damage

The climate and weather patterns are something a farmer feels in his bones, but changes in these patterns and the extremity of events in recent years, shocked rural communities. We never imagined seasons might alter at the pace and scale we see today, bringing losses and damage that undermine years of hard-won rural development. The changing climate has become a food and agriculture crisis. Small-scale farmers are increasingly at the mercy of climate-induced disasters and extreme events.



Given the total reliance on weather patterns and natural resources for healthy yields and produce, the agrifood sector is on the frontline of the climate crisis. Climate change is affecting our capacity to produce food, altering the availability, accessibility, and affordability of food, as well as the quality of water, soil, and biodiversity, increasing the frequency and intensity of extreme weather events, and shifting the patterns of pests and diseases. These impacts increase food insecurity, reducing crop yields, livestock productivity, and the potential of fisheries and aquaculture as food producers.



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Over the last 30 years, an estimated USD 3.8 trillion worth of crops and livestock production has been lost due to climate and other disaster events, corresponding to an average loss of USD 123 billion per year, or 5 percent of annual global agricultural GDP. These disaster events have also been increasing, from around one hundred per year in the 1970's to a current average of four hundred per year. As agriculture, including crop and livestock production, forestry, fisheries, and aquaculture, is one of the main economic activities in developing countries, the implications are profound. Farmers are resilient and have for centuries adapted to changes in their environments. They are the best investment in building resilience and adapting to climate change. But what they are experiencing today goes beyond their ability to adapt.

Support in dealing with both the economic and non-economic losses and damage caused by extreme and slow onset events is becoming a lifeline for farming communities and countries. UN Food and Agriculture Organization (FAO) is committed to supporting countries to assess the extent and magnitude of loss and damage caused by the impacts of the climate crisis on the agrifood sectors; mobilizing adequate and predictable financial resources to support the implementation of loss and damage actions in the sector; assessing climate risks; reducing loss and damage in agriculture; and developing new technologies and practices that can reduce the exposure and vulnerability of food producers and consumers to climate risks, such as drought-tolerant crops, water-efficient irrigation systems, early warning systems, crop insurance and social protection schemes.



The climate and food crises are inseparable. Investing in agrifood systems solutions to climate change will bring big rewards for people and the planet. But not even the most resilient farmers can adapt to all the effects of the climate crisis. Small-scale farmers and agriculture-dependent developing countries must be at the forefront of our collective efforts to address the consequent loss and damage.

\* The writer is the Director-General of the UN Food and Agriculture Organization (FAO)

Source - <https://english.ahram.org.eg>



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## 3D Printed Houses and Disaster Management

A study found that six years after Typhoon Yolanda which caused widespread damage in the Philippines, the affected population still lingered as most of them were still housed in temporary shelters with not so good conditions.

The researchers suggested the technology of 3D printing could be very much applied to construction of houses in disaster- affected areas wherein construction of houses is needed at an urgent pace that normal construction practices and processes is unable to deliver.



With 3D printing technology, permanent structures could be constructed in replacement of the damaged or collapsed houses. The capital cost as well as the running cost of the equipment will justify the urgent need of alleviating the conditions of the disaster- affected not to mention the enormous fund that are allocated in relief, rehabilitation and recovery efforts if not addressed timely. In addition, adaptation of this technique could also achieve the goals of the National Disaster Risk Reduction and Management (NDRRM) framework which is “a safer, adaptive and disaster resilient Filipino communities toward sustainable development”.



## What is 3D Printing?

3D printing is an additive technology used to manufacture parts. It is ‘additive’ in that it doesn’t require a block of material or a mold to manufacture physical objects, it simply stacks and fuses layers of material. It’s typically fast, with low fixed setup costs, and can create more complex geometries than ‘traditional’ technologies, with an ever-expanding list of materials. It is used extensively in the engineering industry, particularly for prototyping and creating lightweight geometries.



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## 3D Printing Technology in House Construction

In the 80's up to the 90's which was the early years of the 3D printing technology, its application was mainly prototyping. However now, in conjunction with developments in computer, connectivity and robotics, 3D printing technology has found its way to varied applications from prototyping to actual product manufacture, prosthetic applications, medicine applications and construction applications as well. Today, with 3D printing technology, a house can be built in a matter of hours or days.



The 3D printing is an automated activity that could decrease the carbon footprint, cost, and duration of construction while increasing labour safety and efficiency. Moreover, its setup is easy & relatively inexpensive compared to the cost escalation because of the breakdown of the supply chain & the eco system at the time of a disaster or a hazard resulting in a disaster.

We are aware that after a CAT event, the affected region needs resilient infrastructures such as Temporary Housing and Temporary Shelters to accommodate the displaced people to protect them against communicable diseases, climatic conditions, and other possible dangers after a disaster. They can be in the form of hotels, tents, modular mobile compartments, rental apartments, and newly constructed temporary units.





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Experts believe this technology can provide disaster-resilient homes more efficiently than traditional houses, which could be beneficial in times of floods, fires, hurricanes, and other natural disasters.

Various companies are using different materials for 3D printing. For example, The Italian company, World's Advanced Saving Project (WASP), has created low-cost shelters using materials such as mud and clay, where series of layers are formed of the same material until the structure is completed.



Figure 1: WASP low-cost material shelter | Source:

Another organization using the 3D printing is New Story - a San Francisco based company that is printing houses in disaster-prone areas - has made houses of lightweight aluminium, which makes it easy to transport and withstand harsh climatic conditions. Further, all the printers have a built-in generator to take over when there are power outages.

When compared with the conventional technology, the 3D Printing technology has the following advantages:

1. Time Saving
2. Cost-Effective
3. Environmentally Friendly
4. Safe and Climate Impact Resistant
5. Transportation and Logistics



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## 3D Printed House in India

Recently, an Indian company, Tvasta Construction, constructed the first 3D printed house, a single-storey house of 600-sq ft unit, in collaboration with Habitat for Humanity's Terwilliger Center for Innovation in Shelter at the IIT-Madras campus. The house was built in just five days. Please refer to the URL: <https://youtu.be/3EHAEo0bm10>

The Indian Army constructed a 3D printed House Dwelling Unit in Ahmedabad in 2022, shown in Figure 2, which is a disaster-resilient structure that complies with Zone-3 earthquake specifications and green building norms.



Figure 2: Construction work of the dwelling unit measuring 71 sqm with garage space was completed in just 12 weeks by utilising the 3D printed foundation, walls and slabs | Source: Financial Express



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## 3D Printed Buildings in Other Countries

In 2021, the first 3D printed building of Türkiye (previously known as Turkey) was constructed. For the building, which stands out with its high heat and sound insulation and environmentally friendly technology, a printable C3/50 class concrete mortar was developed specifically for 60D printer technology.

An African company, called 14Trees, with operations in Kenya and Malawi, constructed the first-ever affordable, 3D printed home was built in Lilongwe, the capital city of Malawi. The company has also recently completed its first 3D printed school in Malawi and is able to build a 3D printed house in just 12 hours at a cost of under \$10,000. Its building process reduces CO2 emissions by as much as 70% when compared with a typical house-building project.

## Insurance For 3D Printed House

In UK, the home insurance policy was launched for 3D printed homes in early 2023. It will cover a range of perils, such as escape of water, theft, and fire. The policy is available for individuals only, not companies. It offers cover whether the whole house or just a portion of it is 3D printed.



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