
Combatting Climate Change Technology White Paper

The role of earth-observation satellites in monitoring climate change is well established. And while debate around climate change is nothing new, natural disaster news stories have unquestionably caught the widespread attention of the general public and governments around the world. This is leading to ever increasing investment in satellite-based climate-change monitoring. If the frequency and intensity of natural disasters continues to increase then battling climate change is set to become a game-changing business opportunity for the LEO satellite industry. In addition to monitoring, satellites are set to play a key role in future regional disaster relief efforts by providing instant cellular and broadband backup communications.

Overview

For several decades, satellites have been used to observe the earth. The data that has been collected has created a baseline against which new measurements can be compared, giving us a valuable insight into variabilities in climate around the world over time.

While not every climate change variable can be measured by satellites, the types of data being collected, and their accuracy, is increasing all the time. Amongst the measurements being made are:

- Greenhouse gasses, such as carbon dioxide and nitrogen dioxide.
- Temperature over sea, land and ice-caps.
- Changes in the size and mass of ice-sheets, sea-ice and glaciers.
- Sea levels.
- Changes in snow cover and snow mass.
- Deforestation.

'... the LEO, HAPS and UAV markets have seen incredible technological advances that are just what is needed to effectively combat climate change ...'

A LEO satellite in a polar orbit can capture daily measurements of the whole earth, thereby creating consistency of measurements over time. On a more regional basis, High Altitude Pseudo Satellites (HAPS), which operate in the stratosphere, typically at heights of around 20km, and Unmanned Aerial Vehicles (UAVs) at lower altitudes provide alternative means of observing the earth and providing services to affected areas.

In this whitepaper, we describe how space and airborne communications systems can help combat climate change and natural disasters, from the perspective of monitoring the earth, predicting future changes and providing direct support such as disaster relief. We also explain how TXMission is actively engaging in this area in order to provide off-the-shelf climate-response payloads for faster time-to-market for satellite and airborne solutions.

Climate Monitoring

Satellites help us to chart local, regional and global changes to our environment. NASA, the European Space Agency and many private companies have large numbers of satellites in orbit monitoring the oceans, land, polar ice-caps, biosphere and the atmosphere.

While there is a degree of general recognition of these capabilities, very few, even in the communications industry, are aware of the quiet revolution that has been taking place in relation to the capabilities and extent of satellite and airborne climate-change monitoring around the world. These changes have been driven by a succession of ambitious government-backed and commercial projects combined with ever-improving technology, including much more sensitive and versatile monitoring equipment. Another key driver has been the orders-of-magnitude improved affordability associated with LEO satellites compared with alternatives.

The result is that the industry is in a great position to address the widespread concern we are seeing around the world in relation to ongoing climate change and climate-related disasters.

Disaster Relief

When areas are devastated by natural disasters, it is not just people's lives that are affected. Communications, such as 4G/5G towers and home and business broadband, in areas hit by floods, earthquakes, fires, etc. are often also destroyed or damaged.

In many cases, it would greatly assist affected areas in getting back to normal if satellite or airborne communications could be used in the interim, while terrestrial infrastructure is repaired or replaced.



(Picture courtesy of NASA)

It is reasonable to conjecture that, should natural disasters continue to increase in intensity and frequency and cause repeated damage to terrestrial communication systems, then space is going to look like a safe space to park one's communications assets by comparison. In other words, we could see a significant migration of communication systems from the earth to space. What a turnaround that would be given that, until recently, satellites were considered the communications medium of last choice, based on the prohibitive costs involved!

Predicting Future Trends

As a result of the diligent collection of earth observation data over many years, scientists are able to create models of climate change that can be used to predict future trends. In principle, if not always in practice, being forewarned allows governments to agree and implement global policies aimed at neutralising undesirable environmental outcomes before they become a reality. In a world where many distrust science and technology (as evidenced by recent impassioned anti-vax campaigns) this is surely a wonderful example of how technology is making things better!

TXMISSION **Combatting Climate Change**

TXMission & Climate Change

TXMission designs and manufactures advanced communications systems for LEO satellites and airborne vehicles (such as HAPS and UAVs). Our products cover modems, SSPAs, LNAs, antennas and control systems for both the space/airborne and ground segments. By providing off-the-shelf, proven end-to-end systems, we significantly cut both technical risk and time to market for our customers.

TXMission has recently embarked on an exciting venture to supplement our current product offerings by working with a range of partners to create full off-the-shelf payload systems aimed at the earth-observation sector. The concept is to allow our users to select from a wide range of plug-and-play options, thereby allowing them to customise their orders to suit their specific needs. In doing so, we are creating a one-stop shop for all things related to climate-change monitoring and associated disaster relief efforts. In turn, this will allow our users to roll out solutions much more rapidly than would otherwise be the case. As part of our efforts, we are very interested in talking to potential suppliers of payload instrumentation.



Summary

In many instances, satellite and airborne services have to compete directly with their terrestrial equivalents. While this is also true to an extent with respect to earth observation, being able to perform global monitoring in real time on a daily basis gives clear, significant advantages to the space industry. The same is true with respect to providing instant disaster relief services such as backup communications systems for affected areas.

Arguably, climate change is set to become one of the defining issues of our current era, if not *the* defining challenge facing mankind. The space and airborne industries are set to benefit greatly from this worldwide focus. TXMission is proud to be playing a small part in this amazing venture.

