SUSTAINABLE DEVELOPMENT IN A SECURITY/ SURVEILLANCE WORLD

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Abstract: Sustainable Development Goals, SDGs or Global Goals for Sustainable Development, as they are sometimes referred to are a collection of 17 global goals set by the United Nations General Assembly in 2015.

This paper looks at three of the goals and outlines how current and emerging technologies utilised in the security/surveillance industry can meet or work towards these goals.

Keywords: sustainable development goals, CCTV, innovation, climate change, climate action, **JEL Classification**: D6, O3, F6, L6

1. Introduction:

The UN Sustainable Development Goals are broad and interdependent, yet each has a separate list of targets to achieve. Achieving all 169 targets would signal accomplishing all 17 goals. "

The SDGs cover social and economic development issues including poverty, hunger, health, education, global warming, genderequality, water, sanitation, energy, urbanization, environment and social justice.

This paper will outline how we can work towards meeting three of the 17 goals which are

Goal 7: Affordable and clean energy

Goal 9: Industry, Innovation, and Infrastructure

Goal 13: Climate action

1.1 Goal 7: Affordable and clean energy

"Ensure access to affordable, reliable, sustainable and modern energy for all.

Targets for 2030 include access to affordable and reliable energy while increasing the share of renewable energy in the global energy mix. This would involve improving energy efficiency and enhancing international cooperation to facilitate more open access to clean energy technology and more investment in clean energy infrastructure. Plans call for particular attention to infrastructure support for the least developed countries, small islands and land-locked developing countries.

As of 2017, only 57 percent of the global population relies primarily on clean fuels and technology, falling short of the 95 percent target.

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1.2 Goal 9: Industry, Innovation, and Infrastructure

"Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation"

Manufacturing is a major source of employment. In 2016, the least developed countries had less manufacturing value added per capita.

The figure for Europe and North America amounted to US$4,621, compared to about US$100 in the least developed countries.The manufacturing of high products contributes 80 percent to total manufacturing output in industrialized economies but barely 10 percent in the least developed countries.

Mobile-cellular signal coverage has improved a great deal. In previously "unconnected" areas of the globe, 85 percent of people now live in covered areas. Planet-wide, 95 percent of the population is covered.

1.3 Goal 13: Climate action

"Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy."

The UN discussions and negotiations identified the links between the post-2015 SDG process and the Financing for Development process that concluded in Addis Ababa in July 2015 and the COP 21 Climate Change conference in Paris in December 2015.

In May 2015, a report concluded that only a very ambitious climate deal in Paris in 2015 could enable countries to reach the sustainable development goals and targets.The report also states that tackling climate change will only be possible if the SDGs are met. Further, economic development and climate change are inextricably linked, particularly around poverty, gender equality, and energy. The UN encourages the public sector to take initiative in this effort to minimize negative impacts on the environment.

Based upon the above SDG targets let's see how development and implementation of new technology can assist towards achieving those goals.

Most people are familiar with CCTV, Closed Circuit Television Systems and their use as an aid in providing security, and will have undoubtedly seen cameras on buildings and perimeter fencing of compounds that use either white light or infra-red lighting to illuminate them at night time, but what many people may not be familiar with is the new technologies emerging that enable modernsurveillance systems not only to be used for security purposes, but as complete management systems providing Health & Safety monitoring, and Head Office Management as well as progress reporting of construction projects to clients.

These systems can be completely off-grid, that is to say that they can utilise their own power sources to provide continuous operation without drawing on the ever-increasing demand for power from national power infrastructures.

2. Current State of The Market:

2.1 Solar Powered Systems:

Solar powered systems as the name implies are powered using solar panels to provide the charging of a bank of batteries, which in turn provide the power for the system. This type of system has limitations and the main drawback is the relatively low power output that the system can produce. Battery charging with solar as a primary source of power can only be achieved during daylight hours, with the main power consumption being at night when illumination in the form of infra-red LEDs is required. This can cause excessive discharging of the batteries thus potentially reducing their lifespan and effectiveness and has a consequential effect of limiting the number of cameras and ancillary devices that can be used with the system.

Solar panels are particularly inefficient and have losses of approximately 80% efficiency, which restricts their geographical deployment to countries that have sufficient levels of sunshine/daylight to provide effective power. In addition to this the solar panels are generally quite large and can be affected by wind and potentially creating excessive movement of the cameras making them unstable and ineffective.

2.2 Wind Powered Systems;

Wind powered systems as the name implies are powered using wind turbines to provide the charging of a bank of batteries, which in turn provide the power for the system. This type of system also suffers from the same limitations as solar powered units which is the relatively low power output that the system can produce. Battery charging with wind as a primary source of power can only be achieved when the wind is blowing above a certain wind speed usually measured in knots (kts) below which there is insufficient rotational power of the turbines to generate power. This type of system if totally reliant upon wind to generate the charging power has potentially serious failure potential due to the inability to guarantee

when and if wind is going to be present at the location of the unit. With the main power consumption being at night when illumination in the form of infra-red LEDs is required, a lack of charging due to insufficient wind can cause excessive discharging of the batteries thus potentially reducing their lifespan and effectiveness and has a consequential effect of limiting the number of cameras and ancillary devices that can be used with the system. Power is a critical component of the system and therefore wind power as a single source lack resilience.

2.3 Hybrid Powered Systems:

With hybrid systems the power is derived from both solar power and wind power utilising batteries to store the power and provide power for the electronic component items within the system. This type of system is better than single source systems due to the dual charging capability, but still suffers the potential of critical failure in the absence of daylight and wind.

2.4 Typical Components of a Self-Powered Rapid Deployment CCTVSystem:

1. Integrated Infra-red lighting using power efficient LED illumination.
2. High Definition, Low Power cameras that operate in ultra-low lux lighting, reducing the requirement for the Infra-red illumination to be engaged, thus reducing the power consumption during darkness hours.
3. Wireless Mobile Technology transmission via 3G/4G network infrastructures, enabling global viewing of live video footage.
4. Also crucially for all video security systems, the use of audio intervention public address speakers to provide live challenges by operators in the event of intrusion or criminal activity.

These are the primary components of a hybrid or renewable energy security surveillance system which is either solar powered or both solar and wind powered.

There are a variety of designs for systems currently on the market which incorporate one or more of the technologies and mostly designed as trailers for rapid deployment.

In addition to the primary components mentioned, effective detection is also paramount. Historically detection of intrusion utilising Surveillance has been achieved using Passive Infra-Red detection. This is quite an in-effective technology, that has limitations in terms of range and coverage and incurs power consumption for the detectors. New technology in the form of Video Analytics has been introduced which requires no additional components drawing power, and is far more effective in terms of coverage and range. Invisible lines or detection zones rhomboid in shape are placed in the cameras field of view which when crossed or entered by a person or vehicle triggers an activation and alerts a monitoring station control room operator.

Video analytics is a developing field which is now utilising deep learning algorithms and artificial intelligence to provide a number of enhanced features and benefits such as facial recognition, vehicle make/model recognition, vehicle number plate recognition, people counting, heat mapping, facial feature recognition and many others. It has become an effective way of providing detection or data gathering that is widely adopted by domestic/commercial users and government agencies.

These types of surveillance systems are not only for security but can be used for Health & Safety monitoring, something that is of significant importance in the workplace and public areas in many developing countries. Effective Health & Safety monitoring can be achieved by video analytics detection zones being placed around dangerous areas or objects whereby any movement within those areas can trigger an automated annunciation warning the person of the danger, or a live alert to an operator who would then take the requisite action.

By having multiple cameras on the system, viewing and monitoring of all areas can be achieved which in the event of an accident or incident can be used as a forensic tool to determine what had happened and the events leading up to the incident, which had there been a fatality could prove invaluable.

Accidents can also be prevented by site managers having the ability to make announcements over the public address speaker fitted to the surveillance system.

Head Office Management is an additional benefit that can be achieved by having the ability to simply connect to a site remotely via the 3G/4G network connection to facilitate viewing of the site without the need to travel there to inspect it. This significantly reduces the carbon footprint by not only reducing the fossil fuels used in the vehicles, but also emissions and manpower. One manager can cover all sites within a region remotely without leaving their office.

Similarly progress reporting can be achieved by either connecting to the site and taking screenshots of the camera images, or programming the system to remotely take a snapshot of the same area of the site every 24hrs which is then compiled as a time-lapse video of the site developing over a period of 6 or 12 months or other preferred time period.

The hybrid systems outlined may not be suitable for all countries based upon their climates and lack of sun or wind. Alternative systems are therefore available such as biofuel powered and hydrogen powered systems. These can be expensive in terms of running costs and I personally pioneered the development of what is one of the most technologically advanced Rapid Deployment Surveillance Systems available in the UK which is powered by Liquid Petroleum Gas. Whilst not being a renewable source, the system was developed to be highly efficient and can operate continuously for 3 months on the gas bottles integral to the unit. This efficiency and the power management systems that we developed have made it an ideal solution to the environment in the UK where the sunlight and wind can be sporadic.

Moving away from the security aspect of surveillance, systems utilising the same surveillance technology with enhanced deep learning video analytics can be used to detect, identify and then deter birds landing on airfields which are a particular problem due to the catastrophic effect a bird strike on an aircraft in flight can have. The utilisation of this type of system at airports can have a significant effect on the reduction of the carbon footprint, by reducing the need for an operative to drivearound the airfield daily on an almost constant basis. Research has found that at Glasgow airport, UK, operational vehicles undertaking this activity emitted 515 tCO_2e annually. If new measures are able to reduce driving activity at large airports like Glasgow airport by even just 5%, there would be a reduction of approximately 26 tCo2e per year.

Having an effective bird control system means that birds can be dispersed from the airfield prior to the approach of aircraft thus eliminating the possibility of strike and the need for aircraft to hold and circle the airfield if birds are present. Irvine et al., (2016) found that, on average, for every minute a plane is in hold at Heathrow airport 233kg of CO_2 is emitted. This new technology could reduce carbon emissions by reducing holding times.

In instances when a bird strike does occur, runways are often temporally closed while the debris is collected. At large airports it can take up to 15 minutes to find and collect debris. Closing the runway can affect up to 8 aircraft on the taxiway and another 5 aircraft at the ramp, forcing 13 aircraft to sit with their engines idling. This equates to 195 minutes of collective idling, consuming 2268 kg of fuel and emitting 7144 Kg CO_2. Moreover, if this results in just one aircraft spending more time in the air, this could equate to a further 3495 Kg CO_2 emissions (McCreary, 2010). In reality this figure could be much more. By using a variety of deterrent measures and reducing collisions, this project could contribute towards a reduction in airport runway closures and emissions associated with engine idling and aircraft holding.

This is yet another way in which technology can play a part, which is not often always apparent at the outset until research is carried out on effective ways it can be used.

3. Goal 17: Partnerships for the goals

"Strengthen the means of implementation and revitalise the global partnership for sustainable development."

Increasing international cooperation is seen as vital to achieving each of the first 16 goals. Goal 17 is included to assure that countries and organizations cooperate instead of compete. Developing multi-stakeholder partnerships to share knowledge, expertise, technology, and financial support is seen as critical to overall success of the SDGs. Public-private partnerships that involve civil societies are specifically mentioned.

By the implementation of that goal, we should be able to achieve what is currently not possible.

4. Discussion and Conclusions:

As can be seen from this paper, technology can play a vital part in achieving the SDGs, and in particular how smart, sustainable renewable technologies can have a part to play in the surveillance marketplace.

We need to further improve and enhance the current capabilities of Rapid Deployment Surveillance systems and also Static permanently deployed ones, additional effort needs to be made to develop more efficient solar panels, more efficient wind turbines and more efficient batteries and power storage systems.

Efficiency in technology is paramount in creating sustainable power from natural resources and by international collaborations from the scientific and engineering communities there is a chance that the efficiencies that we require may be realised. It will happen one day, but will that day be too late? Who knows, but it's better for it to happen sooner than later for the sake of the environment and the World.

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