

Research Article

Artificial Intelligence for Sustainable Development Goals

Ms. Preeti Rana*

*Guru Gobind Singh Indraprastha University, IT department, India.

Received on: 05-06-2021; Revised and Accepted on: 29-07-2021

ABSTRACT

At present, society is facing many environmental challenges such as climate change, clean water unavailability, and other global issues. These issues involve businesses, governments, citizens, and institutions to come forward to solve such global level issues. Many urgent challenges may be resolved only at global level by promoting sustainable development. Sustainability satisfies the needs of people and business without sacrificing the well-being of future generations, promising a balance between care for the environment and economic progress. The main purpose of sustainable development is to find solutions to cope with problems made by industrialization or other SDGs affecting variables. And solving global crises will eventually guarantee the well-being of people and protect the earth. So, all good people need to come together to solve such issues. In this research, I've introduced how we can use Artificial Intelligence (using DATA as our biggest weapon) to solve such major issues as soon as possible, in this digitalized era.

Keywords: Global Goals, Artificial Intelligence, Big Data, Sustainable Development Goals, Robots.

1. INTRODUCTION:

Sustainable Development Goals are those goals which help us to set our target (here 17 targets) and artificial intelligence helps us to achieve those targets. SDGs are global plans for the whole world to end poverty, protect the planet and ensure equality and prosperity among all countries' populations. It's a way of thinking how we can create a world which also fulfills the world's population needs and also make sure that it does not exploit nature or its resources so that future generations do not strive from any of the resources which nature has provided us. And we can use natural resources in an optimized way, so that it does not create any problem which comes under global crisis and creates a balance among all (e.g. in some parts of the world some people are not even able to fulfill their basic needs and in some parts of the world some waste it unnecessary. So has to be controlled. Now here comes AI which can help us to control the utilization of natural resources and also it can provide us better solutions to overcome any danger to humanity.

As the population is increasing drastically so we need to consider the concern towards climate change, poverty, hunger and malnutrition, about life on earth and below earth. Economic growth, clean water and proper sanitization and health issues, gender bias or any type of inequalities, lack of quality education especially to those who cannot afford it. Globalization is also one of the main concerns as it widens the gap between rich and poor countries. Due to which underdeveloped and developing countries often suffer more from global crisis effects. All these global level issues come under SDGs which need to be resolved. Here in this paper I've discussed how artificial intelligence can be used as a powerful tool to mitigate such problems by inclining more towards smart and automated robots and hardware or software tools which are AI powered as it can only help reach our target if we provide data to it. Nature always gives us never takes anything in return but we as humans have always exploited it and its resources without concern that this is going to affect us now or in future. I'm not saying that we should not use its resources or what nature has provided but there should be an optimized way, so that we can balance and control everything we do to minimize the loss.

***Corresponding Author:**

Ms. Preeti Rana,
Guru Gobind Singh Indraprastha University, IT department,
India. Email: ranapreeti345@gmail.com
DOI: [10.46978/ajr.21.2.4.04](https://doi.org/10.46978/ajr.21.2.4.04)



Figure 1. No Poverty

Before thinking about how to eradicate poverty, it's important that we find the main reason for this. And we all can agree that the main reason for this is: UNEMPLOYMENT among all middle and lower classes of society and it affects the poor section of society severely because of this they are not even able to fulfill their basic needs. Why do we see so many slums in different parts of countries even now, when the government has introduced so many schemes and also do these schemes really help all weaker section people?

I do not think so. Schemes like skill development program which can be one of the permanent solution for poverty eradication is a good solution but people who need such schemes are not getting any benefit of it and there are many reasons for this:

- 1) They are unaware of their rights and what the government is doing for them.
- 2) Illiterate people are badly exploited by educated or middle/higher class people. There should be an initiative where not a single person is left behind to get the benefits of any government provided funds/schemes.

1.1 Now how artificial intelligence come handy into this:

- a) AI based IoT connected poverty tracking system at the household level can be developed using AI (artificial intelligence) which can track poverty of each and every house in real time, satellite imagery can be used for this then the informative data can be gathered and controlled at one centralized place, which further can be used to do analysis using machine learning model which is going to provide us classified or predicted images/values. This approach can reduce poverty to a great extent.
- b) Mobilizing resources from non-government sources- Many private sector players can provide help to solve this issue.
- c) Local officials should be strictly evaluated on the basis of how much poverty they eradicated from their areas under poverty alleviation achievements.



Figure 2. Zero Hunger

The 2nd SDG aim is to end hunger and malnutrition so that people of all age group especially children, have proper access to sufficient nutritious food. So there are two solutions to achieve this target:

- 1) To produce more food.
 - 2) To reduce the amount of food we waste daily.
- Both these solutions should be applied at all three levels: Producer, Retailer, and Consumer.
So food waste is inefficient as calories are getting to those who need them most.

2.1 Food waste occurs in:

- a) In developed countries during the consumption phase i.e. by consumers.
- b) In developing countries during the production and distribution phase. Food waste during the production and distribution phase occurs mainly due to inadequate processing, insufficient infrastructure and poor storage.

2.2 So, what's the solution? How can we reduce food wastage and help feed the hungry?

- 1) I believe here we can harness the power of AI (Artificial Intelligence) to solve this issue by optimizing the food supply chain:
 - a) Using computer vision and AR (augmented reality) technologies which are part of machine learning comes in handy. It can identify images and particular objects. E.g. object detection. This helps robots to do visual product inspections (quality inspection), also this technology can help robots to pick products, pack items, etc. work which can be done by automated robots. So this is going to save a lot of operational cost and apart from this robots can provide you with data based decision making.
 - 2) Everyday warehouses produces a massive amount of data. This includes order numbers, inventory stock levels, and shipping details. So we can use data analytics tools to the most from the data which we've or got from sensors in real time. Such robots will identify patterns, predict out of stock items, orders, even returns. Predicts days real time demand for particular products. It can also find the reason for the increase or decrease of demand and even create simulations of such situations.
 - 3) Increases transparency by tracking ocean freight in real time especially those who transport food and need to control the temperature in the transportation unit.
 - 4) Real time monitoring of cargo is possible from web or apps that tracks cargo in the air, on land, and at sea. Moreover it can

track the location, condition and temperature of cargo during the journey of your products. It also predicts possible delays so that you can take proactive action.

5) IoT devices that are attached to the cargo at the time of loading, track humidity, temperature, light and GPS location while the shipment is its journey. Then IoT sensors send data to the analytics platform. Through this you can get in depth analysis and route visualization and can uncover inefficiencies and logistics hurdles and blind spots so that you can take necessary steps to improve them.

2.3 Solving logistics and transport problems using AI-powered apps to:

- Utilize information and find the closest producer
- Predict what foods will be accepted/rejected
- Allow producers to contact managers of store
- Builds trust in how food is made and prepared
- Connects hungry people with people who provide food.

2.4 Maximizing the amount of food available:

- Drones, robots embedded with different IoT sensors can be used to predict food shortages which arise due to crop failure/diseases, natural calamities, rising food prices. At micro level these robot technologies use sensors like multispectral, and can detect the nutritional content in crops/plants the farmer grows. These roots can easily navigate to all parts of fields to capture a wide view of the crop field. Satellite images can be fed to AI model to identify areas that require maximum aid.
- Using gene editing techniques which is one of the main applications of AI to grow healthy seeds.
- Agriculture is considered to be the most effective tool to eradicate global poverty and hunger problems as still many underprivileged people fulfill their basic needs by doing agriculture. So, investing in the primary sector is more effective to achieve these SDG targets than investing in other economic sectors.



Figure 3. Good Health and Well-Being

3.3 Role of AI in managing stress or anxiety problems:

- Predict depression: Social media data can be used to predict depression using ml sentiment analysis.
- AI based virtual counselor can be introduced to reduce stress as these Chabot's can provide virtual therapies to people.
- An anxiety attack can be detected using IoT sensors like wrist watch and AI could immediately offer therapy input on an individual basis.

3.2 Benefits of using AI to help tackle health crisis:

- AI in healthcare can perform medical imaging, preliminary diagnosis, discovering new medicines, AI assisted surgery, virtual nursing assistant, gene editing with more accuracy and pace than human doctors.
- One of the best parts about using AI in healthcare is that it is 24/7 available and will never get exhausted like humans. By saying that I do not mean that it is going to replace doctors' instead these AI clinicians could be the best helper for doctor clinicians.
- Through AI free treatment or aid we could reach those people who are either underprivileged or do not get fast healthcare facilities.
- Technology like virtual reality (VR) can be used with AI clinician's bots, as this technology could reduce the chances of human errors while doing surgery.
- Introduction of such technologies could reduce corruption or fraudulent/criminal act, exploitation of weaker section and illiterate people in this healthcare domain.
- AI can also help us discover new Ayurveda and herbal medicines in a less period of time.
- Exponential increasing population problem can also be encountered using AI by providing free virtual educational programs everywhere especially in rural areas so that people can be aware of words like family planning, female foeticide and infanticide, hygiene, being healthy, etc.
- It could also help reduce the number of deaths caused due to hazardous chemicals, air, water, soil pollution and contamination by making people aware of the negative effects of damaging our nature. People doing any illegal nature damaging activities should be strictly punished. AI powered CCTV cameras' near forests and rivers can also be a good solution for this.



Figure 4. Quality Education

Teachers can monitor complete performance of student in real time in their AI software's dashboard. This would help teachers to monitor all students' performance individually. These suggestions by AI can help both teachers and students to improve themselves based on their weakness and strength. Data gathered here from brain neurons, where IoT device connected to brain detects how students are performing while studying e.g. it can detect whether the student is focused in class or not, etc.

Personalized AI powered apps could provide digital tutoring to those who cannot afford their schooling or tuitions. Also these apps are 24/7 available. Students can easily open themselves more here than in front of their human teachers.

AI help educational institutions to make prediction for

upgrading syllabus, curriculum time to time to enhance teaching and learning, this can save institutions money and time.

Technologies like block chain (peer to peer network) and cybersecurity can be merged with AI to increase data security.



Figure 5. Gender Equality

Gender equality (fundamental right) is achieved when people of all genders have equal rights, responsibility, and opportunity. All society members get affected by it whether they are trans, men, women, children. Considering gender equality issue as one of the priorities could prevent violence against women and girls. With this we can empower girls and women as it will remove all gender bias from society. And it will end all form of violence including girls trafficking, girl marriage, girl child infanticide, domestic violence, sexual and mental harassment, female genital mutilation, etc. Also at many working places women are not paid equal wages as men. This SDG allows us to remove such issues faced by them, so as to promote shared responsibilities, participation in leadership and decision-making in political, economic and public life, equal rights in all aspects whether in property ownership or financial services.

5.1 AI can help achieve gender equality targets as follows:

As algorithms learn from real-world data, AI can potentially adopt and reinforce existing social biases and developers could integrate such gender biases into their AI systems. Gender bias can be reflected in recruiting tools, face recognition systems, search engines. So AI can be thought of as a blank page where if we are passing biased data, it will learn bias or we can also teach our AI systems to avoid it by feeding unbiased gender data. Because what we feed as an input creates a huge difference, as output in a machine learning model learns from what input we feed in our AI/ML model.

5.2 AI for stopping violence:

AI based CCTV cameras can be used to detect or predict if some type of crime is going to happen whether it could be at some working places, streets, or anywhere. Now one problem arises here as how those AI and IoT powered cameras going to detect crime or bad happening inside walls? Well AI has a solution for that also. MIT's New AI Can See (RF-Pose) can detect human movements even through walls using radio

waves. Another technology like walabot helps us to see through walls using only a smartphone.

5.3 AI for encountering problems like trafficking and sexual harassment etc.:

For this radar technology comes into play. As it can cover a huge area under it and can perform certain actions like detecting something etc. as other technologies are also used with it. And can be used at all places whether at land or sea. AI based software apps could be built to provide required aid to women or girl victims. E.g. of such apps are:

5.4 Equal Health:

This target ensures that women and men have equal access to healthcare facilities. This target includes physical, mental and sexual/reproductive health aimed at all gender individuals, such as social services, aid to individuals with disabilities and healthcare. There are certain problems which are more faced by girls/women than by other genders. If concerned about mental health women face it more than men and problems like obesity, cardiovascular diseases or alcohol related diseases are more faced by men. This target of gender equality also comes under SDG 3.

5.5 Equality in Education:

Education gives knowledge which gives power. Women and men, girls and boys do not have the same opportunities and conditions. Still in our society especially at rural areas we can see lot of discrimination between girls and boys, both are not equally treated or granted equal privileges. This target comes under SDG 4 also.



Figure 6. Clean water and sanitation

This SDG ensures that all species on this earth are getting clean water for drinking. Sustainable management of water resources and access to safe water and sanitation is a must for unlocking growth and productivity and also this can help us provide a significant advantage for existing investment in healthcare and education. Water shortage undercuts food security and income of rural farmers while improving water management can leverage the national economy. So protecting and storing water related ecosystems and their biodiversity can ensure water purification and water quality level. Similarly hygiene also plays a vital role for progress in other areas including health, education and poverty reduction, etc.

6.1 Role of AI for 6th SDG:

Untreated water discharged into rivers or sea which cause major harm to all living organisms. Using AI powered urban waste treatment plants maximum amount of water can be treated before discharging it to river or sea. AI can reduce operational cost by optimizing the traditional controllers, continuous monitoring and fault detection software also increases efficiency. AI systems can estimate contamination composition in water of treatment plants and also optimize the chemicals used and reduce the energy costs.

6.2 AI for irrigation purpose:

1) Irrigation uses the maximum percentage of freshwater. But this needs to be reduced as we already have very less amount of freshwater available on earth, so we should wisely consume it so that no one faces its scarcity now or in future.
2) AI systems can understand how much content of water is present in soil and estimate the water demand accordingly for that particular crop growth.
3) It can also predict weather conditions, rain, humidity in the atmosphere etc. and control the systems according to that.
4) Data collected from satellite images, climate, temperature, humidity and weather using their sensors can be further used to make predictions and these predictions help farmers to gain real time insights of their crop growth so that required actions can be taken to improve its quality. For eg. Sensors like soil and light share their data to an AI model that determines the best time to water crops, use fertilizer, and at what amount we need to provide water to our crops, etc.

6.3 AI for the conservation of water:

- Helps to identify leakage and pipe bursts
- Smart water meters



Figure 7. Affordable and Clean Energy

As global energy demands are increasing every year. Fossil fuels won't be able to fulfill our energy needs and also they are not good for the environment because of carbon emissions, so cannot be considered as clean energy. AI and ML technologies can analyze the past, optimize the present and predict the future.

7.1 This SDG challenges solved by AI:

- One of the challenges of this SDG is the unpredictability of the weather. As solar and wind are the main sources of

renewable energy, the power largely depends on the weather. A sudden change in climate can affect the energy flow. The supply chain of renewable energy is prone to such vulnerabilities. Secondly, recent developments in energy storage technology need to be tested thoroughly so as to improve productivity and overcome the shortfalls.

2) The energy grid can be interconnected with devices and sensors to collect a large amount of data. When this data is provided to the AI model, it can give new insights to the grid operators for better control operations. So that energy supplies can adjust the supply according to the demand. It can also help us understand the energy consumption patterns, identify the energy leakage and health conditions of devices.

For eg.- The AI powered predictive analytics can collect the data from wind turbine sensors to monitor wear and tear. The system will monitor the overall health of the equipment and alert the operator when the maintenance is needed. This data would help suppliers optimize the existing services and launch new service models. It can also help retail suppliers to target new consumer markets.

Summary:

Tons of Data gets collected at the control center via satellite. Then analyze and write algorithms for this to predict what's going to happen. It predicts failure in machines, turbines, solar farms, wind farms. And use that data to monitor and control AI.

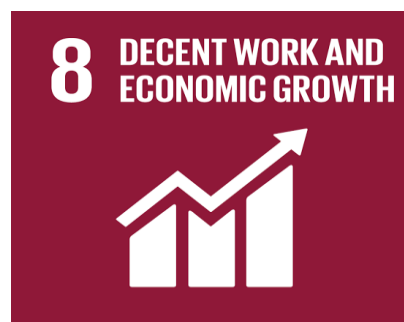


Figure 8. Decent work and Economic Growth

Each year, the global unemployment rate continues to rise which leads to people not having jobs. Without decent work, people are exposed to the risks of many SDGs like poverty, hunger, and loss of good health. This SDG aims to lower unemployment rates increase awareness in job creation opportunities and end modern slavery and modern trafficking. A stronger economy needs better working conditions in regards to safety, equality, and fair wages. So decent work and economic growth are strongly linked to the first three SDGs discussing health, hunger and poverty. Achieving this goal is essential for the general well-being of the society. All SDGs are interconnected with each other. So achieving one SD goal could have a positive impact on other SDGs. Similarly if any one SDG is affected, it could give a negative impact on other SDGs also.



Figure 9. Industry, Innovation and Infrastructure

9.1 This SDG comprises three important aspects of sustainable development:

Infrastructure, industrialization, and innovation. Infrastructure are basic fundamental facilities that support the sustainable functionality of firms and households. Eg. Roads, airports, railways, energy, healthcare, education, sewers, etc. Industrialization drives economic growth, creates job opportunities and thereby reduces poverty. Innovation leverages technological development in industrial sectors.

9.2 AI for 9th SDG:

IN INDUSTRIES and Infrastructure:

- Oil and Gas->[Deep learning (Drilling exploration, tool maintenance, disaster prediction and prevention)],[Machine learning (real -time navigation, decision-making)],[Computer Vision(Anomaly detection, Rock texture classification and many more)],[Pattern Recognition (Machine and tool failure prediction)],[NLP(Amplify user intelligence-feeding machines with knowledge in a natural language.)]
- Food and Beverage-> [Deep learning (Predict and prevent food defects)], [Machine learning (Food delivery apps)],[Computer vision(Food quality inspection, optimized food counting stations)],[NLP (Restaurant search, engines)].
- Pharma-> [Deep learning (prevent any defect), Machine learning (Drug discovery, Drug trial monitoring)],[Pattern Recognition (Precise construction of tablet components)],[NLP(Automated dialogue systems)].

All these AI technologies built can be considered as innovations. It help us automate mundane tasks with more accuracy. This also helps to increase the economic growth of a country.



Figure 10. Reduced Inequalities

Its goal is to reduce inequality everywhere. The Goal of this SDG is to create social economic and political equality regardless of age, gender, disability, race, ethnicity, religion or economic status to ensure equal opportunities and eliminate discriminatory laws, policies and practices that promote inequality.

This SDG is also connected with other SDGs like poverty, gender inequality, hunger, quality education, etc. So solving other SDG targets could help us achieve the 10th SDG target.



Figure 11. Sustainable Cities and Communities

Sensors analyze the use of electricity in various sectors so as to optimize energy distribution across the grid as a result of less frequent power cuts and better distribution of energy. Smart cities are cities that have digital technology embedded across all city function. It may be education, building, shopping, traffic management, waste management every function of city shall use the digital technology water supply, power supply, efficient public transport, sanitation, affordable housing, good governance, sustainable environment, safety and security of citizens, health and education which will improve the quality of life and we can live in a clean and sustainable environment where there is no pollution and the air water and energy are clean. Basically a healthy and safe environment in which greenery is maintained and the natural resources are made available for future generations. Next is to bring harmony and quality of work life so that there is less stress and citizens are more productive at work. This is going to improve the living experience of citizens in the smart city. As more than half of the world's population lives in cities, this number is steadily rising resulting in enormous challenges: more people, more traffic, more pollution, more energy consumption, more water usage, and more waste. Smart cities are supposed to help cope with these problems.

11.1 Smart city consists of following:

- 1) Smart governance
- 2) Smart living
- 3) Smart mobility
- 4) Smart environment
- 5) Smart people

11.2 Smart building advantages:

Distance regulations: Devices which can be controlled from remote locations.

Safe environment: Eg. We can monitor our house, children, and maid even when we are far away from them.

Control their activities: Eg. I can control light, curtains, doors, windows, gas etc. anything at my home even when I'm not there.

Apps for health: Data which is used in monitoring an individual's health is very important for the wellbeing of a person. So smart devices can gather the details of that person and send it to the doctor/hospital. Various healthcare providers can monitor this data and ensure better quality of life for any person who is not well (these IoT devices can provide health related details per second).

11.3 Advantages of smart cities:

a) Smart AI and IoT powered apps. Eg. Using Gateway App, no unknown can enter. So if someone enters the society gate and takes my name, then I will be notified through this app and it depends on me whether I allow that person to enter the society or not.

Feedback feature can be added to such apps to improve its usage.

b) Reduction in resource usage from remote areas.

c) Interaction with smart building.

Eg. Using app Electricity can be set as on/off, we can file a complaint on that app, call for maintenance, and provide feedback etc. feature can be added to such smart IoT and AI connected apps.

d) Environment health (pollution level) can be monitored by sensors. The doors and windows will automatically shut down so that external pollution does not come inside and such IoT connected devices can help to purify the room.

e) Emergency services: Warning issued before any natural calamity happens can save lives.

f) Smart Information alerts at sign boards, if an accident occurs an alert goes out immediately, remote monitoring provides an instant update on the situations.

g) Regular street lights could be replaced by smart poles which connect to other IoT devices. Smart mobility: using self-driving cars accidents hardly ever happen. Drones and robots to deliver goods etc.

h) Smart Harvest: Salad grows underground at the smart urban farms.

i) AR and VR technologies make processes more efficient. Eg. Firefighters on duty can be assisted by the control center and tech helps to find and correct system errors to prevent damage before it happens, this can be referred as Smart Help.

j) Architecture planning can be done using AI simulations. So that architects can decide where to place childcare center, playgrounds, parks, simulations can help them easily decide that in which direction people can get maximum amount of sun rays at the time of winter and minimum at the time of

summer i.e. less sun rays more cold wind and shadow at parks in summer time vice versa at winter solstice.

k) AI to help archaeologists trace back the ancient presence of humans by revealing hidden traces in the soil. The AI will be able to recognize even minimized or imperceptible variations in vegetation or other particular signs of the surface that may indicate the presence of remains not yet discovered, the identification of sub-surface cultural heritage sites has taken advantage of Remote Sensing data, a way of detecting that allows to find buried objects in the sub-soil through images in which it is possible to recognize subsoil archaeological deposits from anomalies and traces in bare soils, crops, or vegetation. Accurate detection of the cultural heritage objects through satellite imagery and a clearer identification of ancient division systems.

l) Road Management: Heavy vehicles movement damages roads. Building a network of weight monitoring sensors for heavy vehicles can help control road damages.

m) Avoid corruption: IoT produces a large amount of big data. Opening vast amounts of data to the public has potential advantages in terms of increasing transparency and openness. The data can help citizens and businesses in self-service, ensure proper oversight, reduce labor and fraud cost, automated security, and improve opportunities in process efficiency.



Figure 12. Responsible Consumption and Production

If I discuss machine learning or artificial intelligence solutions here, then it would be same as I discussed in 3rd SDG. Few more ways discussed here to achieve this SDG's target:

1) Chef could use smart dustbins, through this chefs would be able to collect data of people how would've thrown their food inside dustbin and this gathered data then could be used to analyze and find what type of food does their customers like and what they discard.

2) Smart Consumption and Production: Do not waste what you eat, even if you have extra food provide it to someone who need it. You can do so using smart AI apps which could connect people all around the world and can provide peer-to-peer free food services. Here those who would've extra food left either producer, consumer or retailer could donate it to those who are poor or do not have money to afford food using mediator AI-apps. Through this some of the major issues like poverty, hunger could be resolved in a better way.

3) Fighting pollution, reducing the overall waste generation and improving the management of chemicals and toxic wastes.

4) Supporting companies' transition to green infrastructures and practices.

Achieving this SDG targets simply mean that you should use everything in a limited way so as to avoid any type of wastage to attain sustainable development.



Figure 13. Climate Action

As we know that climate change is affecting all countries in all continents. It is affecting all livelihood lives and national economies. Taking necessary steps in an early stage could help us tackle climate change issue which includes problems like extreme weather events such as droughts, floods, cyclones, handling water management problems, reduction of agriculture production and food security, damaging infrastructures, increasing health risks, interruption of basic services like water, sanitation, energy, sustainable energy and transportation.

13.1 Climate change due to:

a) Electric systems:

Electric systems are responsible for a quarter of human caused greenhouse gas emissions. Machine learning can help reduce the carbon footprint of electric systems by:

1) Forecasting power generation and demand, increasing the safety of nuclear power plants, by reducing fossil fuel and electricity loss.

Fossil fuel loss could be caused during transportation due to the leakage of pipes so it will detect pipeline damages and predict pipeline maintenance using sensor and satellite data and electricity loss can be reduced by using smart IoT connected electricity grid which will do all predictive maintenance work.

2) Modelling live electricity emissions: without having an idea of how much emissions are caused by consuming electricity at every moment, industries and consumers cannot make eco-friendly decisions regarding when machines with high energy consumption should be run.

Machine learning can help model current and future emissions of electricity and thereby inform people when the consumption of electricity would cause lower emissions. This will improve electricity grids by inclining towards smart cities and buildings in developing countries could resolve the above mentioned issue.

b) Transportation:

Transportation systems cause about ¼ of global-related carbon dioxide emissions. It includes all modes (road, rail,

water, air). Two-third of emissions are caused by road travel alone but emissions due to air travel are on rise.

ML here: Smart IoT vehicles and electric vehicles, autonomous vehicles could help us achieve this target. More and more use of CNG, petrol and diesel free oils consumption, use of bicycles for small distances should be made mandatory.

c) Building and cities:

Enabling smart buildings, understanding the energy consumption of cities, improving low emissions infrastructure.

d) Farms and Forests:

Overall land use is estimated to be responsible for about ¼ of greenhouse gas emissions. Further, an increase of forest fires releases carbon as well. Better land management and more efficient agriculture practice could achieve the target of greenhouse gas emissions reduction from our atmosphere.

ML practices here: Tracking deforestation, helping with forest fire management, enhancing precise agriculture practices, protecting important natural and manmade biodiversity, sanctuaries.

e) Industry:

Reducing factory energy consumption.

Reducing waste in the supply chain.

ML can help develop structural product that require less raw material, reducing material by inventing new constructions.



Figure 14. Life below water

Everyone wants to live in a world where all life that exists below water from the smallest to largest animals, is able to live in clear and healthy water. The plants and animals that live in the water are important for all life on earth. Planktons the tiny worms that call out oceans their home, that play a big part in keeping earth's atmosphere healthy as they generate a lot of oxygen. 3 Billion People, almost half the planet rely on fish for food and fish oil is great source of energy for our body as it keeps our BP in check and help our heart stay healthy. But life under water is in threat due to overfishing, marine pollution, acidification of oceans, carbon emission, loss of habitat, climate change, chemicals, transportation, etc. are some of the reasons.

The Australian government created the world's largest marine safe zone where it's illegal to fish, giving endangered species a chance to repopulate. Communities are volunteering to clean up beaches that are littered with harmful trash. And innovators

are creating new inventions like one that is used to suck in oil discharged from boats or ships.

In California, green roofs, protecting the sea by absorbing acid rain contaminating pollutants what would otherwise run off and affect the water system. It's our responsibility to protect the world's waterways.

Oceans' became dumping ground. Fishes are getting caught in plastic bags and drowning and others are eating plastic microbeads contained in toothpaste to skin care products. Fishing, mining, drilling are making oceans conditions bad for aquatic lives.

14.1 Applications of AI for 14th SDG:

- 1) Whale inspired underwater drone could carry out rescue operations where humans cannot reach. Underwater drones used for sinking ships search/rescue for divers.
- 2) Ancient Greek shipwreck is now protected by underwater AI robots (preserving underwater importance monuments or any ancient object found).
- 3) AI robots will solve underwater infrastructure damage checks and will protect it simultaneously reducing the risks to humans while improve efficiency.
- 4) Human trafficking and terrorist activities are most common through waterways. Here AI can monitor, predict danger and stop it before happening. For eg. Terrorist submarines can be detected using AI surveillance robots.
- 5) AI could also be used to classify and predict ocean acidity to reduce declining of marine life and to protect our natural or man-made biodiversity or sanctuaries.
- 6) Data collected from oceans can be used by those people who are studying over oceans, they can also find new medicines, understand climate change, can find endangered species, extract energy resources, natural oil, etc.
- 7) AI sensors could be used to gather data about earthquake under water, temperature, tsunami type of natural calamities, discovering new species/plants. In short all activities inside water could be monitored and the data gathered could be used for further analysis using different technologies like AI, IoT, machine learning, deep learning, computer vision, etc.
- 8) Human settlement could also be possible underwater, this will also help us protect land resources and use under water resources. So an artificial water colony could be made just like an island but the difference would be only that islands which we saw till now were natural but here I'm mentioning about man-made island which would be based on smart cities concept i.e. smart island city (SDG-11).

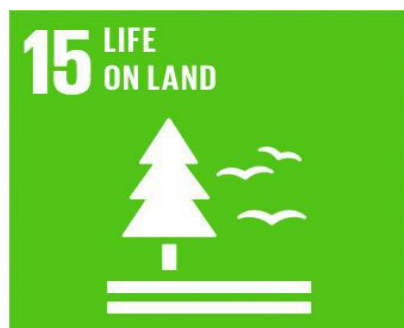


Figure 15. Life on Land

This is our world. So it's our responsibility to take care of its resources and to use it in a balanced way so as to avoid its depletion. Otherwise we are the only one who is going to face the consequences. Our food, shelter and our means of livelihoods are all connected to the very resource that has already suffered immensely from irresponsible human activities. Preserving diverse forms of life on land requires targeted efforts to protect, restore, and promote the conservation and sustainable use of our ecosystems. This SDG mainly focuses on improving the dreadful condition of agricultural lands, forests, animals, etc.

15.1 AI based technology application here:

- a) AI research are already using satellite imagery to start to track how re-forestation is progressing.
- b) Through AI farmers could now integrate massive sources of data from satellites, sensors, etc. Taking all that data together and through an AI solution actually making recommendations to the farmers on how they can increase the production on their land.
- c) AI powered technologies could be used for poaching detection which would eventually reduce problems like animal hunting, deforestation, crimes happening in forest areas, so that proper actions could be taken to nullify its negative effects.
- d) Different sensor technologies like radar (used for motion detection) could be used for intrusion detection, camera used here for confirmation and identification. And Autonomous Aircraft Vehicle Drone controlled by the surveillance radar system to support threat identification could be used for threat detection and identification in any field, working 24/7 in all weather conditions.
- e) Radar technologies combined with electro-optic devices where electro optic devices are used to identify suspicious targets with its ability to classify objects using radar information could be used for providing protection and monitoring in any environment.
- f) Wireless detection fence with a mesh network of discrete sensors could also be used.
- g) Object detection, pose detection, activity detection, intruder classification or detection, all this is possible through AI-powered technologies to achieve SDGs targets.
- h) Change in resources could be seen easily using Hot maps which can even see through haze, monitoring through radar to detect deforestation or any suspected activities in early time so that appropriate actions could be taken accordingly.
- i) Combine near-infrared spectroscopy with AI to quickly measure soil nutrients, pH level, moisture and organic matter.
- j) Analytics solutions can make use of spectroscopy in the visible and near-infrared ranges. It provides far more quantified data than visual inspection by farmers. This allows systems to adjust irrigation or nutrients levels to optimize the quality and quantity of the production.
- k) AI algorithms for early plant detection using hyperspectral imaging and wireless sensor networks (IoT). This helps in discriminating between different disease types (eg. Virus, fungus, bacteria) before the human eye could see them. Hyperspectral imaging technology to help vineyards improve their harvest. The solution allows for real time measurement of components in grapes, that contribute to their ripeness and flavor, this provides farmers better insights on how to improve the quality. Also, it detects early signs of plant stress in a greenhouse setting.

l) For the dairy industry, they offer spectroscopy solutions to monitor protein and fat concentration in milk samples. They also offer real-time data on macro-nutrients present in animal feed.

m) A large number of environmental and physical variables that are beyond the farmer's control, such as weather, ground water availability and invasive pests, influence crop yield could be dealt using precision agriculture, which aims to minimize the risk that comes with fluctuations in these variables. Aerial or space-based spectroscopy solutions allow the measurement of these variables over large areas of land. By creating drone based hyperspectral solutions for precision agriculture. These sensors record spectral signature in the near-infrared range, visible and ultraviolet ranges to pick up physiological changes that are not visible yet. ML algorithms then analyze these signatures to predict pest, disease and weed outbreaks.

n) One of the driving factor of shortwave infrared is that it could detect objects in low-light and complete darkness. This feature makes it suitable for its usage in military and surveillance. Additionally, shortwave infrared has an added benefit of low power consumption and could be used to measure temperature, therefore used for fire detection purposes.

o) AI also pinpoints local pollution hotspots using satellite imagery data. Then this gathered data could be used to make further predictions. For making predictions on this data first weather data then satellite data is added to fine tuning as this approach allows algorithms to take full advantage of the information present in satellite imagery data.



Figure 16. Peace, Justice and Strong Institutions

This SDG aims to achieve targets like reducing violence everywhere, protecting children from abuse, exploitation, trafficking and violence. Promote the rule of law and ensure equal access to justice. Reduce corruption and bribery. End all types of crime and conflicts and control financial flow, aiming to stop practice of money laundering and firming strong justice and institutions for all without any discrimination on the basis of race, caste, sex, creed, color, etc. Its main aim is to provide transparency among all sections of society.

16.1 AI can help solve above mentioned issues in the following ways:

a) Money laundering: Here AI and IoT powered CCTV cameras and radar technology, can be used to spy money laundering and illegal activities. But let's assume that the culprit has passed this stage and

defended himself or his members then his next stage would be to deposit that money (which he got by doing some type of crime) to the bank. Now here bank's use different AML (Anti-Money Laundering) software which detect transactions as fraudulent or not fraudulent using machine learning anomalies detection algorithms like isolation forest, clustering algorithms, etc. combined with old rule based systems.

Graph analytics are also used to find patterns in 3D space to find suspicious activities in transactions.

All these techniques to solve money laundering issues convert all the mundane tasks to automated tasks.

While dealing with money laundering we will need to encounter three stages:

1) Placement

2) Layering

3) Integration/Extraction

Above maintained ways of tracing them online are valid only then they are not anonymous. But if they've hidden their identity it would be difficult to trace their illegal activities.

Graph algorithms- community detection, PageRank, similarity of neighborhood-all these identify meaningful graph oriented patterns, finding user groups, reporting weakness in operations or a supply chain. Here we traverse the graph, and that traversal could be represented by arranging the node vectors next to each other in a matrix, you could then feed that matrix representing the graph to a machine learning model.

b) Corruption: AI with block chain peer to peer technology can resolve corruption issues at all levels. Especially if voting systems are based on block chain technology, the chances of corruption in this domain will reduce drastically. If transparency is increased between public and government, then the corruption problem can also be decreased to a great extent. And if we talk about corruption at offices, govt agencies, etc places then as before CCTV-AI and IoT connected devices could work here well to get the work done.

c) Violence, trafficking and conflicts: In 3rd SDG I've already mentioned about how ai can be used to stop violence and trafficking. Here I'm going to explain how conflicts can be reduced with the help of artificial intelligence: Predicting where and when conflicts will escalate into war or where food shortages might lead to famine etc.

1) Predicting where and when conflicts will escalate into war or where food shortages might lead to famine etc. Issues could help peacekeepers and aid agencies intervene in humanitarian disasters.

d) Detecting hateful content on social media. As, this type of content should be filtered from all sites because its consequences could lead to conflicts, suicides etc. problems.

SDG related targets if not achieved could give rise to mass conflicts among people of all societies, communities, countries. Also after detecting such filthy content necessary actions could be taken on time to avoid any awful situation to happen.

e) Justice system: AI based systems are going to provide a great relief to judges and lawyers. As then they will not have to do a long research on any case which they are handling. This will also save their time and effort. Also most of the time judges' judgement is based on their own experiences, which is not a good way to provide justice to someone. But an AI system which when used can provide justice to everyone irrespective of their background without any discrimination, it's decision will be based on all the historic facts which the AI system learnt from past experiences, simultaneously using reinforcement

learning methods to improve itself with time through trial and error approach. As we see many judges and lawyers are corrupted, they exploit people a lot especially those who are either illiterate or 've less knowledge of their fundamental or legal rights, so using such tech systems could improve the condition of our judiciary system.



Figure 17. Partnerships for the Goals

Information is power, AI tools can indeed be effective to uncover and even predict corruption or to renew government services systems.

Partnership includes sponsorship and support from more companies in the industry.

It can be hard solving a problem on our own, but when we work together, people everyone can make good things happen through partnership between people, communities and countries, we can solve global problems so that everyone is treated equally, everyone 've what they need and the natural world is able to survive and thrive. Partnerships are like teams, they connect groups of people who come together through shared interest. Eg, If they want to build a new bridge they cannot do it alone, they need someone to design the bridge, they need someone to pay for it, they need someone to put in the foundation and they need someone to build it. Partnership let us do impossible. If it's not there then it's hard to solve global level problems. A person alone cannot build a bridge or feed a village or educate all the children in a city. They need other skilled people to do it. That's what partnerships are. People from all around the world can be brought together to take problems from every corner of globe. Global challenges require global solutions. We need people with different skills, ideas, and customs to work together to solve problems that affects us of all. And we all've a role to help UN achieving these goals faster. The air belongs to everyone so it's to every nation to make it cleaner and that starts with cutting back CO2 emissions with electronic vehicles. If only half pumps out greenhouse gases it will be impossible to achieve. Partnership between nations gives up hope. Even a problem like climate change can be solved. But partnerships are not simple. They require equality and mutual respect. Eg. If an outbreak of influenza threatens the health of a nation then govt. officials, doctors and people in the community need to communicate, compromise, collaborate to remove illness and keep people safe. If they cannot work together partnership can break down before solutions are found.

Let's understand this more through an example:

In Ghana, due to poor infrastructure lots of rural houses do Not have electricity so it was necessary to look out partner

who could help. They recognize China have vast experience in renewable energy production and the UN development programs facilities collaboration between nations. Today this partnership is making life better for millions global issues like climate change, diseases and poor infrastructure factors which affect everyone.

References:

- 1) <https://sdgs.un.org/goals>
- 2) <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- 3) https://en.wikipedia.org/wiki/Sustainable_Development_Goals
- 4) <https://medium.com/vizzuality-blog/tagged/sustainable-development>
- 5) <https://medium.com/world-food-programme-insight/tagged/sustainable-development>
- 6) https://www.undp.org/content/undp/en/home/blog/2019/Using_AI_to_help_achieve_Sustainable_Development_Goals.html
- 7) <https://en.unesco.org/artificial-intelligence>
- 8) <https://phys.org/news/2020-01-ai-impact-goals-climate-global.html>
- 9) <https://borgenproject.org/using-ai-to-fight-poverty/#:~:text=AI%20could%20help%20address%20or%20predict%20some%20of,by%20accurately%20predicting%20crop%20yields%20months%20in%20advance.>
- 10) <https://www.nationalgeographic.com/environment/article/artificial-intelligence-climate-change>
- 11) <https://news.microsoft.com/europe/2018/12/03/using-artificial-intelligence-to-help-fight-against-childhood-malnutrition/>
- 12) <https://www.mckinsey.com/business-functions/mckinsey-analytics/our-insights/ai-in-production-a-game-changer-for-manufacturers-with-heavy-assets#>
- 13) <https://www.nature.com/articles/s41467-019-14108-y>
- 14) <https://aiforenvironment.org/>
- 15) <https://www.ecomena.org/artificial-intelligence-environmental-sustainability/>

Article Citation:

Authors Name. Ms. Preeti Rana. Artificial Intelligence for Sustainable Development Goals. AJR 2021; 2(4): 17-28.

DOI: [10.46978/ajr.21.2.4.04](https://doi.org/10.46978/ajr.21.2.4.04)