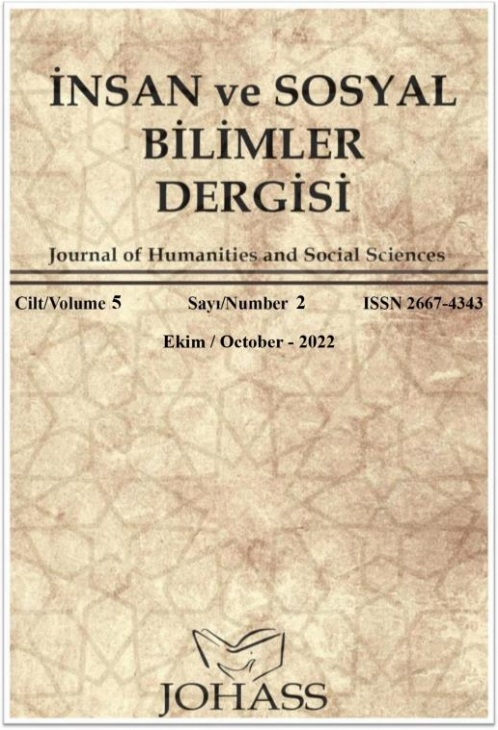
JOURNAL OF HUMAN AND SOCIAL SCIENCES (JOHASS)



https://dergipark.org.tr/tr/pub/johass

A review on Risk Reduction Potentials of Artificial Intelligence in Humanitarian Aid Sector

Ahmet Efe[1]
IFRC, OIAI, Audit
icsiacag@gmail.com
Orcid ID: 0000-0002-2691-7517

Artichle Type: Research Artichle
Received: 15.10.2022
Revision received: 22.10.2022
Accepted: 27.10.2022
Published online: 28.10.2022

Citation: Efe, A. (2022). A review on risk reduction potentials of artificial ıntelligence in humanitarian aid sector. *Journal of Human and Social Sciences*, 5(2), 184-205.

A review on Risk Reduction Potentials of Artificial Intelligence in Humanitarian Aid Sector

Ahmet Efe[1]
IFRC, OIAI, Audit

Abstract

Many humanitarian system bottlenecks can be overcome with the help of artificial intelligence (AI) and other complementary emerging innovative technologies. Research and investment in the development of AI tools tailored to resource-poor settings will accelerate the realization of the full potential of AI to improve global well-being. It is argued that AI algorithms and machine learning techniques have become necessary in humanitarian aid operations due to their impact on efficiency and effectiveness. The study further argues that AI has the potential to support humanitarian INGOs like the IFRC and recommends that current risks, including those related to ethical issues and privacy concerns, should be addressed so that they are not deployed at the expense of humanity. Various analyzes and evaluations are made in this direction, claiming that critical issues such as need assessment, estimation, method determination, field monitoring, auditing, and reporting in humanitarian aid are to be realized through innovative technology with relatively less resources allocated. That is why the practical and efficient use of humanitarian aid funds spent by relevant institutions has become a critical issue. In this study, the applicability of AI to humanitarian aid is evaluated in terms of technical capability under the Emergency Social Safety Net (ESSN) program operated by IRFC Türkiye.

Keywords: Humanitarian aid, artificial intelligence, smart systems, non-discrimination, neutrality, disaster recovery

Research Artichle

Received: 15.10.2022
Revision received: 22.10.2022
Accepted: 27.10.2022
Published online: 28.10.2022

[1] Corresponding author:
Dr. CISA, CRISC, PMP, Senior Auditor
icsiacag@gmail.com
Orcid ID: 0000-0002-2691-7517

Introduction

The combination of intelligent machine understanding with intelligent program software paved the way for the great achievements reached today in AI. In the 1970s, the science of artificial neural networks emerged and in the following years, deep learning studies were continued in AI studies. Afterwards, studies were carried out on how the increasing uncertainties in the economic, business, climate and political fields could overlap and respond to the applications of AI, and after the 1990s, the discipline called "*fuzy logic*" was born. Thus, AI could now be applied by thinking about solutions and making decisions on unclear issues. Afterwards, studies began on AI to solve more difficult problems, and the science of genetic algorithms emerged. Now with the AI it is aimed to develop solutions to problems that are difficult to solve in many areas from commerce to health, from space sciences to nature, and now humanitarian aid processes and public spaces meet AI technology. From unmanned aircraft to autonomous missiles, from robots that translate foreign languages to robots that do R&D, plan, and code, we are rapidly advancing in a digital transformation process. Despite the current challenges, AI holds tremendous promise for transforming humanitarian services in resource-poor environments and mitigate trending risks of inefficiency, waste, and ineffectiveness.

AI can now help farmers in developing countries identify areas prone to war and natural disasters by providing massive amounts of data analytics beforehand. Farmers can access this data with their smartphones easily. According to experts, soil and other data can be analyzed using AI, and farmers can send the results. Aid organizations are also using technologies such as AI to combat the global food shortage. Many hope that these gains will eventually reach farmers in food-stressed regions. Precision farming is a method of measuring and shaping the variability of crops in general. This farming aims to provide less waste in land management and optimize efficiency. AI and nanotechnology will then enable better management of crops and soil. The United Nations estimates that 840 million people will be affected by hunger by 2030 (Ali, 2021). To help reduce that number, researchers have set out to pursue a path that combines AI and machine learning with intelligent agriculture. Finding sustainable agricultural solutions to this problem requires bold new approaches and integration of knowledge from different fields such as materials science and informatics. AI can analyze vast amounts of data to help farmers in developing countries and local areas affected by conflict or natural disasters. Farmers can access this data via smartphones. However, developing countries lag in accessing new technologies. Even with technology, there are other hurdles. It may take a long time for new technologies to reach developing countries. Still, many hope that advanced technology will reach farmers with food security problems. Those working in aid organizations say entrepreneurs should look to places outside their home countries to develop technologies to combat global hunger and provide pertinent support. Moreover, farmers need to receive training to prevent hunger in developing countries using AI. The same methodology can be applied to humanitarian aid, relief, capacity building, development, and assistance operations.

The increase in the frequency of natural disasters and humanitarian events worldwide has led to an increase in the loss and damage that negatively affects the lives of millions of people every year. Therefore, "*risk reduction*" has become the most critical component of disaster management practices since it adds value to efficiency, effectiveness and economy of processes. In addition, risk reduction studies against natural hazards have been defined as an integral part of sustainable development, and comprehensive global programs have been developed and innovative unified planning programs have been introduced by humanitarian organizations like IFRC. However, despite of its novelty in humanitarian setting, the impact of AI is very critical in achieving strategic results with less resources.

Research and investment in the development of AI tools tailored to resource-poor settings will accelerate the realization of the full potential of AI to improve global well-being. It is argued that AI algorithms and machine learning techniques have become necessary in humanitarian aid operations due to their impact on efficiency and effectiveness. Various analyzes and evaluations are made in this direction, claiming that critical issues such as need assessment, estimation, method determination, field monitoring, auditing, and reporting in humanitarian aid are to be realized through innovative technology with relatively less resources allocated. That is why the practical and efficient use of humanitarian aid funds spent by relevant institutions has become a critical issue. In this study, the applicability of AI to humanitarian aid is evaluated in terms of technical capability under the Emergency Social Safety Net (ESSN) program operated by IRFC Türkiye. The field information and lessons learned from the IFRS Türkiye delegation through the Emergency Social Safety Net (ESSN) program, funded by the European Union Aid Agency DG-ECHO, are also used in this study. OIAI ESSN Auditors try to provide consultancy services and leadership to embed AI algorithms both in audit, management and workstreams.

The basic research assumptions of this study are the following items:

- AI can be used to reduce human error and save time.
- It is crucial to identify those who are most in need, those exposed to the most significant risk, and those who cannot survive on their own among the Syrian refugees residing in Türkiye.
- The IFRC Delegation to Türkiye has considered the ESSN program not only for the universal principles of humanitarian aid but also for the objectives of effectiveness, efficiency, and economy in all operations and workstreams.

Our research argument was formed within the framework of the above assumptions:

"*IFRC can use AI techniques and practices to reduce deviations in targets, increase its positive socio-economic impact, and eliminate unexpected exceptions*". To make correct logical, contextual and paradigmatic analysis this study starts with definitions of literature and the problems of humanitarian aid; continues to dig into the key concerns with AI applications and key application areas; understands importance of humanitarian logistics and emergency logistics planning system (ELPS); discovers the potential application of AI in preventing sexual abuse; makes discussions over humanitarian diplomacy on the axis of the IFRC and application of AI with concluding remarks.

Literature and the Problems of Humanitarian Aid

Keywords used in our study were searched in the Scholar database. As a result, it was determined that around 1950, studies were carried out. No research has been found when looking at the titles of the used ticks. According to this, in a limited search with "*humanitarian aid*" and "*artificial intelligence*," around 44,000 articles were found. However, it was understood that only 3 of them were mentioned in the article's title. Therefore, it can be said that this study can be of great value in terms of contribution to the literature. Research shows that AI and nanotechnology in the agriculture sector can provide practical solutions to the challenges and problems that threaten global food security. Moreover, this data can help determine when to grow which crops and how to tackle with. Farmers must also be trained to harness the power of AI technology and address hunger in developing countries. A study, led by researchers at the University of Birmingham, explored how precision agriculture can enable farmers to respond in real-time to changes as they grow crops using technology (Misthi, 2021).

The primary motivation for innovation in agricultural technology is to feed the global population, prevent the reduction of agricultural land and protect soil health and environmental quality. This showed how much plants absorbed the nitrogen used in the

farming process. It causes a large part of the nutrients to mix with the water and air and warm the planet. About 12% of global greenhouse gases come from agriculture, making inefficiency a severe threat to environmental quality. One out of every nine people in the world suffers from hunger, and this number is increasing day by day. Poverty is not the only reason for this. Charities use technologies like AI to fight global food security (Lee, 2018).

Swasdee *et al.* (2020) asserted that AI, Remote Sensing (RS), and Big Data have impacted society values. The usage of AI, RS, and big data analysis is quite promising because it enhances capabilities for problem-solving mechanisms. Their research investigates the rise of AI, RS, and Big Data in the context of humanitarian aid and insurgency. Zhongming *et al.* (2021) described that in any disaster humanitarian aid organizations need to determine the extent of damage to buildings in the affected location and work out which transport routes are safe to use as quickly as possible – ideally in the real-time. Aikin *et al.* (2022) have shown that data from mobile phone networks can improve the goals and objectives of humanitarian aid at the local scale if it is supported with AI algorithms. They used an approach that uses traditional survey data to train machine learning algorithms used to recognize poverty patterns in cell phone data and have demonstrated that they can prioritize assistance to the poorest mobile subscribers thanks to trained AI algorithms.

Relief supplies must be delivered to inaccessible areas quickly and effectively in case of disasters or conflicts. With these demands in mind, researchers from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR) are developing and testing new AI technologies that enable drone-based analysis as part of the Drones4Good[1] project. DLR's interdisciplinary team includes researchers from security, aeronautics, and space (DLR, 2021). They are working closely with the United Nations (UN) World Food Programme (WFP), the German Federal Agency for Technical Relief (Technisches Hilfswerk; THW), the aid organization ISAR Germany and the international project Wings for Aid. Imran *et al.* (2020) described that AI for Digital Response (AIDR) is one of the AI platforms that collects and analyzes social media textual and imagery content in real-time at the onset of a disaster to gain situational awareness and actionable information. These efforts are coordinated with several regional and global partners, including UN OCHA and UNICEF (Imran *et al.*, 2020).

Humanitarian aid organizations are trying to develop various mechanisms to prevent this situation. The most important of these is the responsibility to the donors (upward accountability), and it expresses the accountability of the charities to the donors who fund them. Another control mechanism is the responsibility towards the beneficiaries of humanitarian aid (downward accountability) and envisages informing people that they have fully received their assistance. Both-sided transparency and accountability play a critical role in preventing undesirable situations in humanitarian aid work. Some of the issues that will prevent the humanitarian system from effective functioning are as follows (Bakır, 2016):

- The probability of a humanitarian project being funded by more than one donor.
- Nepotism or bias in the selection of aid workers and the distribution of aid.
- The donor avoids funding a significant aid project with government intervention or, on the contrary, must make unnecessary financial contributions to organizations and projects that many institutions donate to through government intervention.
- Aid workers in crisis areas use their positions and aid projects to benefit themselves or their families
- Losses due to carelessness in the supply, storage, and distribution of humanitarian aid

[1] See for the details: https://www.dlr.de/content/en/articles/news/2021/01/20210208_launch-of-the-drones4good-project.html

- Being careless in areas such as invoices, product, and service quality in the procurement of humanitarian aid materials.
- Abuses are likely to be committed by the host state in regions where humanitarian crises are experienced within the system: insisting on delivering humanitarian aid from abroad to the state, directing assistance to groups prioritized by governments, etc.
- It demanded cash or payments from aid convoys of irregular militias or official armed forces that manage checkpoints in areas where humanitarian aid is urgently needed.
- In the most extreme cases, non-financial corruption such as exploiting women and children in return for aid, threatening people in charge, or those in need to condone the corruption.
- National societies or local NGOs can collide with local politics or interest groups.

The above issues are the most frequent ones. But behind these there are three factors that trigger these undesirable situations, which are likely to be realized within the humanitarian aid system. It is possible to summarize these motivations as;

a) Repression or inclinations,

b) Rationalization and

c) Opportunities,

In theory, being in need or not having enough financial support to survive is related to the rationalization dimension of the misuse. Those in the aid sector and those who control the transactions to which humanitarian aid will be provided can consider their financial difficulties sufficient for corruption, thus legitimizing their actions in their world of thought. They can also block third party audits with double accounts, data anonymization and falsifications.

Another distorted result of rationalization is that the attitudes of the humanitarian aid personnel, who overspend during their duties to attract the public's attention, cause those in need who are trying to survive in crisis geographies to see themselves as having the right to exploit or steal aid. The idea that everyone is corrupt in some countries and areas and the widespread belief that things will only work that way are also reasons that pave the way for the rationalization of corruption in the eyes of individuals. Rationalization will be easier in existence of severe internal control weaknesses. That is why ethical frameworks, and their implementations should be provided by organizational setting alongside with tree lines of defense embedded in internal control system.

Accountability in the humanitarian system should not be considered a process that can only be limited to fulfilling the state's legal procedures or the ministry to which it is affiliated. A civilian institution must have accountability mechanisms for that community. This can be done individually by informing the donor in different ways, or it can be achieved through annual publications for the whole community.

When humanitarian organizations apply ethical values and standards of behavior without compromise, most of the problems caused by individual mistakes are prevented. The most crucial problem is the problems that may arise from the problematic countries where the crisis regions are located. With the guidance documents to be prepared to overcome these problems, humanitarian aid workers become prepared in advance about how to act in case of any situation. Humanitarian principles should be supported by digital principles and could be together reflected to explainability matrix in terms of strategies, alignment, stakeholder expectations, legislative compliance and internal regulations.

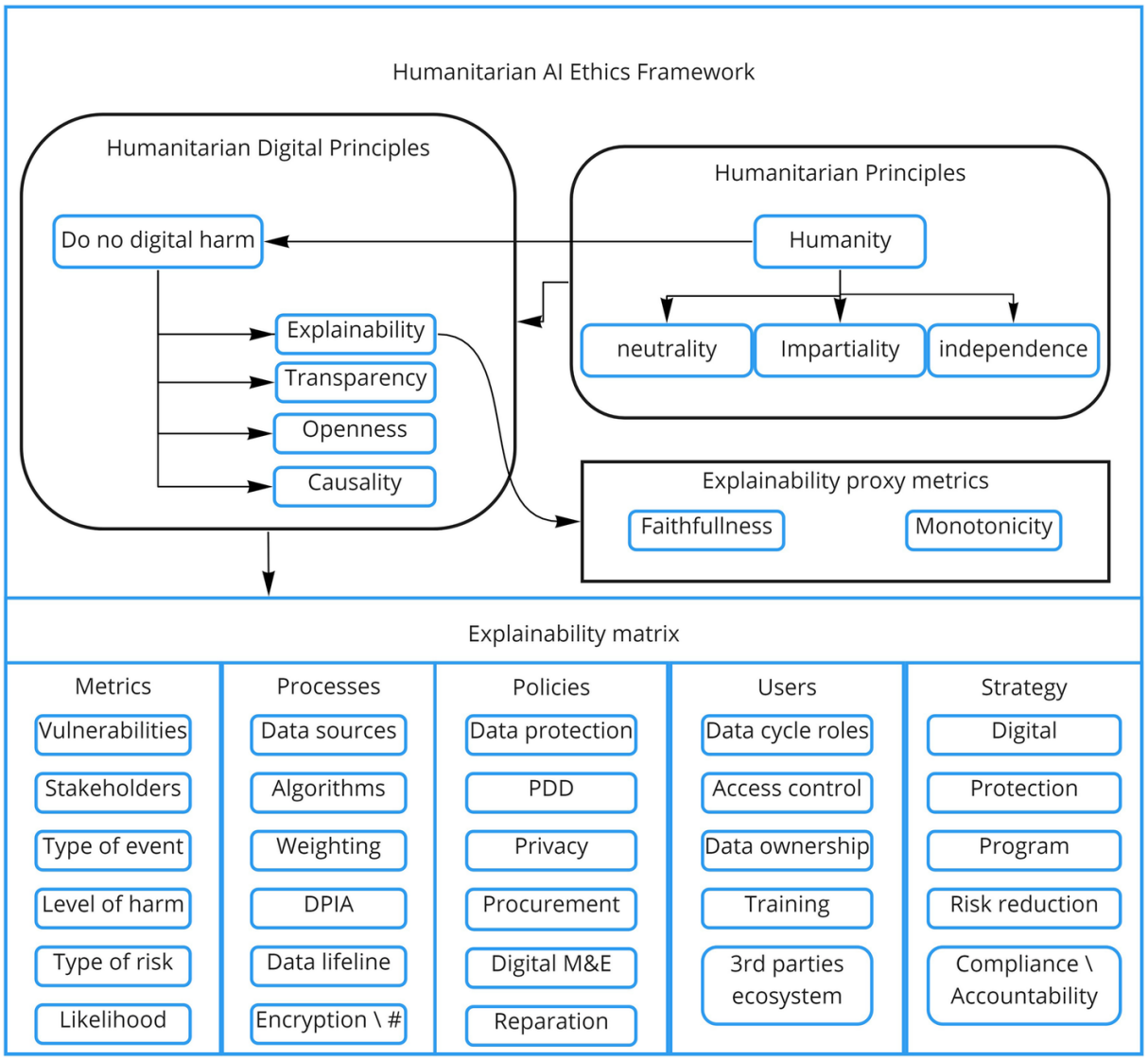


Figure 1. Ethics Framework for AI in Humanitarian Sector
Source: (Coppi et al. 2021)

Concerns with AI Applications and Key Application Areas

The mechanization of war technologies is widely criticized, primarily due to ethical concerns. However, it is stated that it is possible to develop AI by considering such sensitivities. Ronald Arkin, who has been working with the US Department of Defense for many years, states that robots, free from feelings such as anger and stress or momentary inattention and developed with an emphasis on human values, can behave much more ethically than humans (Arkin, 20156). Unmanned wars could be waiting for us with the impact of international competition, the integration of AI on the battlefield is making progress faster than ever before. So, what will be the changes that this technology, which the leading countries cannot give up despite all the discussions, will bring? What awaits us? With AI in attack and defense systems, wars where borders disappear, and people are not involved may be waiting for us. They will be able to wage war themselves with the help of vehicles such as aircraft, drones, or submarines under the control of high-tech AI, sensors placed in the region, and their algorithms (Pandya, 2019). Machines, which can instantly detect the slightest movement in the enemy field, will be able to intervene much faster than when they are under the control of humans. For example, AI-controlled drones can find soldiers injured in conflict

areas. Uncrewed aerial vehicles are also expected to be used for oil exploration, protection of the continental shelf, control of migration routes, prevention of human traffic, and smuggling (ThinkTeck, 2020). China Dominates Airspace with AI. Robot soldiers, shown as more advanced technology, will help people in field missions, especially in determining strategies and humanitarian aid organizations' search and rescue works. Soldiers on the battlefield will act much healthier by feeding on the data collected by both drone and robot soldiers. Processing this data; that is, it may be a matter of time before we meet machines that act on the information transmitted by the data and make decisions to attack or withdraw. This means that people play a much more backward role in wars. It is thought that AI, which also helps the army with cyber security, may design special weapons and even warplanes in the future (Joshi, 2018). China uses drones, which can carry mortar shells, grenade throwers, and machine guns, can also come together and carry out coordinated attacks. When the commander receives an attack order from the soldier, the drones that take off automatically hit the locked target coordinated and return to the main base (Peck, 2019). Sky Hawk, another uncrewed aerial vehicle of China that cannot be detected by radar, has significant potential, although it is in the development process. Sky Hawk, which can travel long distances at high altitudes and warn the army by a reconnaissance in the conflict zone, like the US B-2 bomber, will share this data by communicating with other human-crewed uncrewed aerial vehicles. It is stated that this type of technology, which can communicate with both human-crewed and crewless aerial vehicles, will accelerate target identification, increase attack power, and reduce casualties (Huang, 2019). Israel and Russia are also working for fully autonomous weapons the Israeli army is also investing in autonomous, that is, self-managed drones with AI. The GOSHAWK drone system, specially developed to destroy kites and balloons used for arson in the Gaza Strip, detects an arsonist device as soon as it takes off with optical sensors; immediately takes off, destroying the threat. This whole process takes place from start to finish without human intervention (Staff, 2018). Marker, the war tank-sized earth robot introduced by Russia in a video in March 2018, seems to change the balance on the ground. In the two-minute video released, we see Marker and a soldier fighting shoulder to shoulder on the battlefield. It is predicted that the operators who manage these drones today will be replaced by fully autonomous AI (Axe, 2019). The USA will have tanks that can "see" ahead one of the countries that have made the most significant investment in this technology is the USA. In a statement made at the beginning of 2019, the US military announced that the only way to counter some weapon systems was to use AI (Cox, 2019). Two government companies have collaborated with AI to strengthen the defense system (Roth, 2019). However, talking about the most up-to-date and advanced ones is necessary. Boeing aims to develop vehicles that can move autonomously in sea, space, and air. The company's most notable product is the RQ-21A Blackjack, an uncrewed aerial vehicle that can fly to an altitude of 19,500 feet and fly approximately 16 hours a day. The vehicle can obtain a view by processing the image and video data with AI technology; it can drive itself by seeing its front (Naval, 2019). The US military has called on the defense industry for AI rifles enhanced with facial recognition technology (Malewar, 2019). Russia announced that it would double its investment in AI (Apps, 2019). In other words, the countries that rule the world will continue to increase their investments in this technology. This makes us think that robot soldiers, which can only be seen in sci-fi movies, warplanes that can hit targets without human intervention, and rifles that can "recognize" people are not that far away.

Despite of its risks and threats, AI still is giving more benefits to humanity. According to NASA's Space Studies Institute, Goddard, from the data collected from 1880 to 2016, the average global warming is about 0.8 0 C between these years, and the warming is accelerating (Bennet, 2016). There will be drought due to global warming, the prevalence of diseases caused by climate change, an increase in flood disasters, an increase in solid hurricanes, heat

waves, forest fires, and other natural disasters, and famine because of the expansion of deserts (Mohamedou, 2014). This result is striking because it shows that there will be an increase in natural disasters. In addition, the gradual increase in metropolitan nation and population density suggests that the loss of life and property will increase in case of possible disasters. When natural or unnatural disasters occur, the first 48 hours are critical for the victims to be saved alive. In this case, it becomes crucial to mobilize all available resources.

Robots have been helping people in emergencies in recent years, and there are enough applications to say that this will continue to increase. It is thought that robots and AI can profoundly contribute to disaster and disaster management. The environment in which the disaster occurs can undergo significant structural changes, making it difficult and impossible for people to work in this environment. It is not appropriate for people to enter and research areas with risks, but surveillance and rescue of disaster victims are also required. Robots can be beneficial in such dangerous situations. People in a disaster environment are adversely affected by the depressive nature of the domain. By their nature, people cannot work productively for a long time, their minds may get tired, and as a result, they may make mistakes in their evaluations and decisions (Özen, 2017).

On the other hand, robots do not have fatigue or adverse psychological effects. They can work in areas where people and animals cannot work. When it is necessary to detect structural damage, they can collect data. They can carry vehicles that are vital for disaster victims. They can see the location. Summarizing what AI supported robots can do in a disaster environment, the following will come to mind first (Özen, 2017; Çapan, 2021):

- Early warning,
- Removal of debris,
- Area Search,
- Discovery and mapping,
- Medical assistance,
- Structural and forensic review,
- Transporting the victims and removing them from the hot zone,
- Mobile repeater,
- Providing logistic support,
- Detection or estimation of the size of the debris,
- Direct intervention

The design of robots to be used in disasters is an essential issue. Unlike other robots, they must be large enough to operate in extreme conditions, have sensor performance, and be durable. In addition, they must be able to work and communicate outside of GPS coverage or in places where there is no WiFi access. In addition, since it will interact with humans, it must be designed to communicate with both the operator and the victim. The design should consider the people's mental states in the disaster environment.

Humanitarian Logistics

Logistics is one of the key difficulties in case of conflicts or emergency situations. INGOs and national societies are investing more on logistics aspect of humanitarian context. For humanitarian aid to be effective and efficient, the logistics of humanitarian assistance should be designed in the best way, and the process should be managed correctly at every stage of the operation. From the first stage to the last stage, it is expected that the refugees will arrive at the shelter centers where they live and that the aid will be delivered by taking all the precautions in a border or cross-border aid. In terms of correct management of the process, it is concluded that success will be achieved in coordination and cooperation by separating the aids according to their types, analyzing them according to their needs, sending them to the

desired points. Those activities should be in a way that does not create waste when necessary, creating a warehouse order according to the shipping frequency of the separated goods, ensuring that the information systems reflect the stock status up to date. In this direction, it is seen that aid to refugees is not as easy as it seems. The primary purpose is to manage the process effectively and efficiently with fewer mistakes by raising awareness about what to do in the future. However, the same level of migration movement and form is not desired. This case intends to inform the countries' policies, their reactions to this situation, and the form and extent of aid. Türkiye has been providing economic development assistance to many countries, especially in Africa. The sum of official and private contributions within Türkiye's development assistance scope reached 4.3 billion dollars in 2013. This amount is low compared to developed countries may attract attention. In an environment where the USA, the world's largest economy, provides 30 billion dollars of development aid annually, it is appreciated that a developing country like Türkiye offers more than 4 billion dollars in development aid (Intel, 2020).

The Turkish Red Crescent, and other NGOs operating to deliver humanitarian assistance to immigrants and collecting aid from donors in this sense, regardless of whether they are national or international, are free of waste, aiming to find the real needy, on the spot, on time and in the right way. Specialization in providing aid is essential in minimizing the waste of resources. The most outstanding support in this process can be realized by making significant technological innovations. It is of strategic importance to find people in need and create the necessary communication environment so that their needs are met not by many institutions but by only one institution in the amount and time that will solve the problem. It should not be denied that with the synergy created between the relevant organizations, a cure can be produced for the wounds of more people with less amount. As in almost every other issue, one of our sine-qua non in humanitarian aid logistics is to increase the efficiency and effectiveness of the process with effective communication mechanisms. As a final determination and delivery of the right, Türkiye, particularly the TRC, has reached the most generous country and institution globally compared to its population. This situation should be developed and continued as an indicator of the appreciation of Türkiye (Dindarik and Fidan, 2020).

Emergency Logistics Planning System (ELPS)

The priority of disaster logistics is to ensure the survival of people and prevent loss of property and life. Disaster logistics differs from other logistics services as it is not for profit. Disaster logistics must be event-based and dynamic because the type, severity and effects of disasters are different. Effective communication, information sharing and informed decision-making play an important role in disaster logistics to supply adequate relief materials and determine the carrying capacity in the first two weeks of the disaster response phase. Otherwise, it causes improper use of resources in disaster response and an increase in mortality. With the model, it has produced quantitative solutions for the lack of communication and the inability to make the right decision, which causes problems such as the accumulation of aid materials in the event of a disaster and the inability to supply the materials that are needed (Şen, 2017).

In the late 1960s, neural networks were widely used in demand forecasting of emergency supplies as a new AI method. In other research areas of AI, the superior arithmetic precision and data processing capabilities of machines, the advantage of machine learning based on big data and deep learning algorithms are in internet-based commercial logistics, especially Google, Amazon, Alibaba, etc. It has been rapidly developed by technology companies represented by in terms of emergency resource management, government departments have many relevant social data. Because of the contradictions and risks of data

security, AI often gives systems the ability to make intelligent decisions and run automated operations without any human intervention. This procedure is based on a combination of three elements: Algorithms, regular sequences of operations applied to best perform a task based on prevailing conditions. In recent years, emergency materials demand forecasting methods have been oriented towards incorporating AI and attempting to simulate research. As a result, although great attention is paid to the rich variety of methods available in areas such as big data mining and the application of smart devices, few have focused on such an approach when seeking demand forecasting approaches for emergency resources (Tzavella et al., 2018; Zhu et al., 2016).

With the rapid development of cloud computing, internet of things (IoT), and virtual reality (VR), various smart devices such as computers and mobile phones have been used as data collection ways in the last few years. Despite the rich variety of methods available in areas such as big data mining and the application of smart devices, it has been considered in researching demand forecasting approaches for emergency resources, few studies to date have focused on such an approach (Hjorth and Kim, 2011; Tzavella *et al.*, 2018). In recent years, a combination of smart devices based on big data analytics and other traditional forecasting methods has been proposed to meet dynamic demand forecasting for emergency resources (Adiguzel, 2022).

The current functioning of the humanitarian aid system is primarily based on predetermined goods and services, not on meeting the needs of the aggrieved people in the region. In other words, the system operates according to the determined conditions. The boundaries are drawn instead of considering the wishes of societies stuck in humanitarian crises. Thus, the primary purpose of humanitarian aid, the satisfaction of those in need, is also ignored. This situation casts a shadow over the reliability and universality of the humanitarian aid system and the principles of this system, whose rules are set by the Western states (Bakır, 2016).

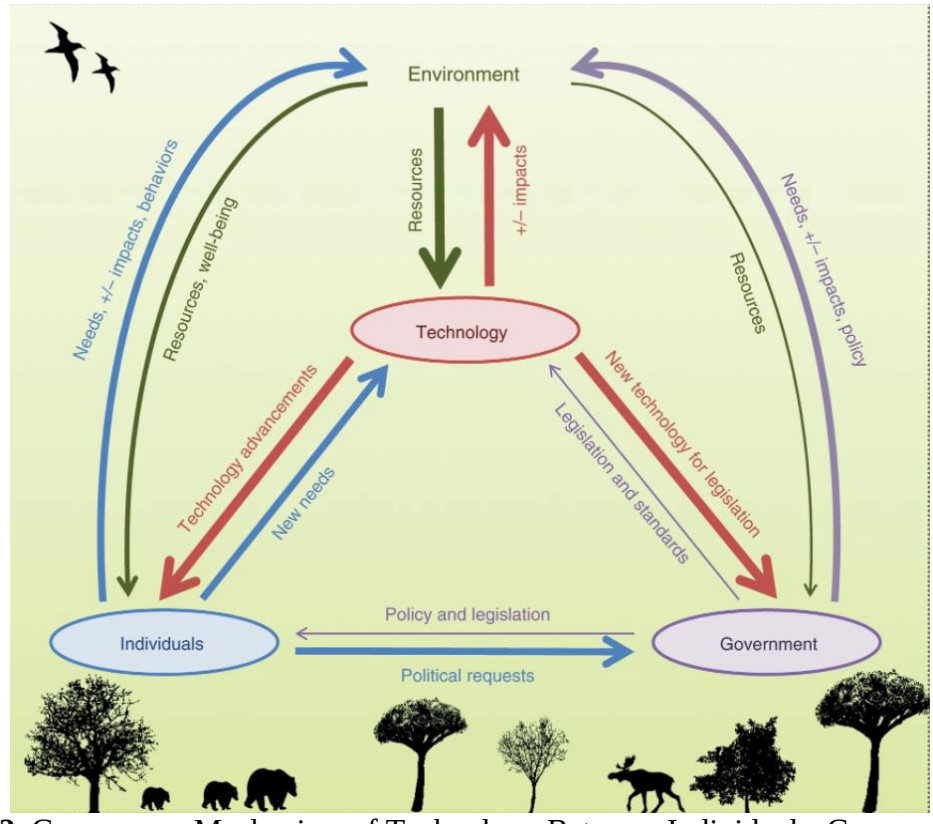


Figure 2. Governance Mechanism of Technology Between Individuals, Government and Environment Elements.

Source: (Wahl et al., 2018; Bakır, 2016).

Precision farming using AI and nanotechnology offers exciting opportunities for sustainable food production (Zhang, 2021). Using AI to help humanitarian organizations find poor areas or improve farming techniques is just the beginning. There may be dozens of other ways AI can help alleviate poverty and help develop local business. First, AI can help fill the education gaps that many poor people experience. Access to information has always been a big differentiator with poverty. We are looking at a different world to use the right tools and develop the right programs. Where children receive below-average (or no) education in schools, self-guided computer learning programs like Khan Academy can allow anyone to "*learn everything*" for free. If developers apply AI to such programs, the tools can learn from and respond to users by adapting to their specific needs. Furthermore, these programs can help even more people if translated into mobile platforms, slowly becoming universal (Meinetten, 2017).

When the studies are examined, it is understood that robots have the necessary flexibility to solve the search-and-rescue problem due to their learning and adaptation abilities. Since the disaster environment becomes non-modelable and unpredictable, it would be appropriate for the robot to be autonomous and have AI. It should ensure that the robot sensors are not affected by dust, gases, and radiation in the debris environment. The use of robots in search and rescue studies is an area where human-robot interaction is more prominent than in other applications (Özen, 2017).

Potential Application of AI in Preventing Sexual Abuse and Harassment

The most common abuse that goes unnoticed, especially in vulnerable societies, is sex. Incidents of child abuse and sexual abuse are increasing exponentially, whether online or through the physical abuse of humanitarian beneficiaries. Although childhood sexual abuse (CSA) is a worldwide phenomenon with negative long-term consequences for victims and their families and a significant economic burden to society, one of the main challenges in treating CSA is the reluctance of the victims to disclose their abuse and the reluctance of professionals in the absence of forensic evidence. it cannot be detected easily without the help of AI (Kissos *et al,* 2020).

In Montreal, the "*Botler AI*"[1] chatbot uses deep learning technique on data from US and Canadian criminal court documents and sexual harassment complaints, as it can provide free legal information and guidance for victims of sexual assault who have little knowledge of their rights. This data may enable the software to evaluate whether the user is subject to criminal law and which specific laws have been violated and may also generate an incident report that the user can submit to the relevant local authorities if they wish. AI systems like this can be encrypted, used around the clock, and programmed to provide attentive and non-judgmental responses. For example, since the encrypted report provided by a service like Botler AI can ensure the privacy of the victim, it aims to be an alternative source for complainants to be informed and freely share their experiences without fear of being prosecuted, thereby empowering its users with confidence based on concrete legal doctrine. In America, advances in AI-powered forensic DNA technology and robotics are increasing the viability of rape kits. For example, criminalists at the Oakland Police Department have developed a faster and more effective way to detect victim and attacker genealogy using AI, and new technologies are also being developed to reduce backlog in the rape kit which are accumulating incredibly for long-lasting laboratory analysis. The new robotic equipment has allowed states like Ohio to process nearly 14,000 delayed rape kits, helping indict more than

[1] For details see: https://botler.ai/

300 serial rapists (Cassidy, 2020). Thai police Lieutenant Colonel Mekhyanont developed a similar chatbot, SisBot, aiming to use AI as an alternative approach to assist victims (UNWOMEN, 2019). SisBot can also advise victims on how best to preserve evidence of the incident, and the chatbot can also assist with official police investigations. Thus, AI can illuminate the justice administration process and help victims gain vital information to navigate the legal system.

While humanitarian organizations like the IFRC try to increase controls on this issue through education and awareness, it seems difficult without technological and algorithmic assistance. In a sensitive society, digital exploitation material can also be more easily obtained due to the risky and uncontrolled environment. 16 years after the United Nations Convention on the Rights of the Child (UNCRC), child exploitation and sexual abuse is still gaining momentum over the last two decades. The definition of child abuse and sexual exploitation is not limited to physical abuse but also includes online sexual abuse. The UN 2018 report identifies 18.4 million suspected online abuse cases and notes that Child Sexual Abuse Material (CSAM) has increased over the past decade. Another study by The New York Times found that major tech companies have reported that more than 45 million images of children have been abused, and the Internet Monitoring Foundation also found that 39% of online CSAM were victims under the age of 10, of which 43% were abused. Another report by the Internet Monitoring Foundation in the UK states that online child abuse has increased by 50% during the COVID 19 quarantine and that despite the many strategies implemented to reduce child abuse incidents, international organizations are undoubtedly not achieving their goals (Aoukar, 2019).

As technological solutions are invasive, an often-asked question is "*Can AI help reduce child sexual abuse and sexual exploitation online?*". Here are some of the best AI technology that can help reduce child sexual abuse (Oriel, 2020):

1. Safer[1] – Developed by AI Company Thorn, this AI-powered tool as a tool is going forward in the plan to eliminate CSAM as it can detect images of child abuse with approximately 99% accuracy to identify, remove and report child sexual abuse material at a scale. More than 100,000 known CSAM files are said to be able to be removed while Safer is in beta and just getting started. Its services include:

- CSAM Image Classifier - Can use a Machine learning model to determine if an image is suitable for CSAM.
- Image Hash Matching - This can generate cryptographic and persistent hashes to match past CSAM hashes to identify images of sexual exploitation.
- Video Hash Matching: It can generate cryptographic and continuous hashes to match videos with past CSAM hashes.

2. Child Safe.AI[2] – As an AI platform that monitors and models the risk of child abuse on the web, this AI platform, already deployed by US law enforcement, can actively collect signals of abuse threats from online ecosystems where they are known to occur, and model this signal according to potential risk. Observing millions of conversations, content, and photo signals can help organizations reduce the risk of child abuse.

3. Spotlight[3] – Developed by Thorn, this technology can use predictive analytical logic to identify victims of child sexual exploitation and child trafficking. It is also already used by the US Federal department to solve complex child trafficking cases, as it can identify potential victims of human and child trafficking by analyzing web traffic and data collected

[1] For details see: https://safer.io/
[2] For details see https://childsafe.ai/
[3] For details see https://www.spotlight.ai/

from sex ads and escort websites. This AI-based tool was able to help identify 14,874 children who have been victims of human trafficking in the past four years.

4. AI Technology from the United Nations Interregional Crime and Justice and Research Institute (UNICRI)[1] – This technology uses AI tools and technologies to locate long-missing children, screen illicit sex ads, and eliminate risks of human and child trafficking. It can use robotic technology and is still developing.

5. Griffeye[2] – This technology can use computer vision tools such as face detection and image recognition to scan images with parameters of nudity and age and has already been deployed by US Federal agencies to detect and block CSAM.

6. Google's AI tool[3] – In 2008, tech giant Google introduced an AI tool to reduce online child abuse using deep neural networks in image processing. This technology can help rank reviewers and NGOs trying to remove abuse by prioritizing the most likely CSAM content for review. This technology can identify and flag new images of child abuse by training on real CSAM and using computer vision. It can be used hypothetically with a mixed list and helps to prioritize cases involving child sexual abuse, thereby reducing the manual workload of the researcher.

7. Cellebrite AI tool[4] – Cellebrite AI tools can use AI and machine learning algorithms to help researchers streamline the process of compiling, analyzing, and reporting evidence of child abuse.

Humanitarian Diplomacy Discussion on the Axis of the IFRC and Application of AI

Humanitarian organizations expect sustainable solutions to many global issues arising from population growth, decreases in resources, conflicts in the ecosystem, social, cultural, and economic difficulties, human rights violations, terrorism, violence, internal armed conflicts, and many other ongoing issues. The most negatively affected subject is "*humanity*" within the framework of all these problems. The efforts to find a solution to all these existing problems by both the states and the international community, but the emerging reality of not creating a concrete answer, symbolize two different sides of the coin. Internal armed conflicts, crises, and natural disasters are among the current issues that arise in quantity.

In addition, one of the important actors that come to the forefront within the framework of the concept that covers the activities of humanitarian organizations for the relevant regions with the aim of "*Preventing Human Suffering*" is the International Committee of the Red Cross (ICRC). The concept of humanitarian diplomacy, which emerged during humanitarian crises, is of great importance and priority if the focus is on the "*human*" element in the world order, which acts within the framework of realist discourse and rigid power policies in the axis of accelerating and increasing crises in the world. In this context, it is one of the most basic requirements for states, international organizations, and non-governmental organizations to act on common ground and share responsibilities with a holistic approach to make the humanitarian diploma work (Köksoy, 2017).

The "*AI for Development*" community has published several observational reports on how AI is applied in resource-poor environments. It is seen that AI applications in the field of health are insufficient in the academic literature in underdeveloped environments that are relatively poor in terms of resources and need for human resources. Expert systems can support health programs in environments where resources are scarce; for example, medical

[1] For details see https://unicri.it/artificial-intelligence-and-robotics-law-enforcement
[2] For details see https://www.griffeye.com/
[3] For details see https://ai.google/tools/
[4] For details see https://cellebrite.com/en/home/

expert systems can support physicians in diagnosing patients and choosing treatment plans, just like in high-income countries. For some conditions, if an expert is not available, they may act as a human expert, especially in resource-poor communities, so expert systems are deployed in environments where resources are already scarce. AI is already being used to predict, model, and slow the spread of diseases worldwide in epidemic situations, including in resource-poor environments. For example, since birth, asphyxia syndrome is not always predictable or preventable; cases often require prompt and skilled resuscitation in the delivery room. Researchers using this approach found that the application was 77% sensitive and 95% specific in determining the need for birth asphyxia in tertiary perinatal medicine centers (Reis et al., 2004). Another example is Dengue fever, a vector-borne disease that has spread rapidly worldwide in recent years, with about half of the world's population currently reported to be at risk (WHO, 2017). After researchers developed an innovative AI-based tool to determine whether land-use patterns in Manila are associated with dengue transmission, the AI algorithm learned how to fine-tune its model to predict dengue occurrence with increasing accuracy (Hornyak, 2017).

Neuro linguistic planning (NLP) can also be applied to a wide range of public health issues, using unstructured texts in the medical literature and data from the web to support clinical decision-making. It can also be used or analyze EMRs to monitor community health behavior. For example, NLP can improve treatment protocols to monitor health inequalities (Wieland, 2018). NLP and machine learning can also guide cancer treatments in underdeveloped settings that are low-resource or need humanitarian assistance. (Swetlitz, 2016). Researchers trained an AI application to provide appropriate cancer treatment recommendations by giving necessary explanations about patients and telling the application the best treatment options. When examining different patients, it can be said that this practice agreed with specialists in more than 90% of patients in one study and 50% in another. Therefore, AI planning can already be applied to improve primary health care delivery in environments where resources are scarce or need humanitarian assistance. These tools can be implemented in a multi-layered system (Wahl et al., 2018).

The humanitarian sector is taking the first step with AI by testing different AI/ML capabilities of different national societies, and Norwegian and Danish Red Cross Societies have realized the first AI application examples (Toplic, 2020). Turkish Red Crescent partnered with Microsoft and their partner Mart Software to build a content management system to reunite families affected by the Syrian refugee crisis (Microsoft, 2022).

The Humanitarian Principles and innovation must be aligned between civic institutions and the IFRC movement to provide services to humanity through a longer-lasting impact. Because innovation is a distributed and participatory responsibility, the role of the innovation team at the IFRC should be to bring better structured and longer-lasting impact to the adoption of these innovative technologies. The advisory role of the OIAI auditing oversight body should focuse on facilitating, nurturing, and accelerating this effort with good practice and accountability through incremental improvements to foster independent global humanitarian action. For this, capacity-building studies should be carried out to improve the AI competency levels of auditors.

Because innovation is about trying different solutions in critical programmatic areas, difficult circumstances require taking calculated risks while adopting innovative and more competent operational technology. They require innovative technologies, tailored products, redesigned processes, innovative partnerships, and funding mechanisms. These synergies must combine to continually improve and respond to changing needs and contexts by anticipating and preparing for the future transformative change for the IFRC. Like digitization and data analytics, digital health, virtual reality, and AI are at the core of this effort, including multiple departments, units, and delegations worldwide.

From the disaster relief environment, climate change, migration, social unrest, youth volunteer engagement, discrimination, gender inequality, sexual abuse, pandemic response, and detention, the challenges are increasing to the INGOs like IFRC. With the current climate change/Covid 19/Ukraine/Migration crisis, there is an increasing need to strengthen guarantees and funding to enable more intelligent operational technology to enable humanitarian practitioners to increase disaster preparedness and response. VR provides a valuable benefit over face-to-face meetings as science and academic research shows that advanced VR training results in more excellent retention and behavior change. In conflict settings, AI-based VR training for teaching International Humanitarian Law (IHL) to the military is more effective than PowerPoint presentations and face-to-face meetings. AI-powered VR environments allow for better information retention, assessment, intelligent reporting, and sharing, as digital knowledge drives behavior change and facilitates broader tools to train local actors in situations where humanitarian delivery deployments are impossible. However, humanitarian practitioners must ensure that increasingly digitized work environments are cybersecurity-safe, using big data analytics combined with AI capability, and not threaten the right to privacy from increased surveillance and monitoring.

Results and Discussion

The humanitarian system is problematic and requires practical cooperation, especially among non-governmental organizations with proper oversight, governance, and collaboration. However, due to the political concerns of the Western regimes and distrust of local institutions, humanitarian assistance is interrupted. The efforts of UN agencies and INGOs to make secure donor agreements and raise safe humanitarian funds have turned into a repressive competition and financial doubts that hinder the efficiency of the humanitarian system. However, the changes focused on humanitarian aid tools and economic costs in combating humanitarian crises should include new techniques, rather than the fundamental problems of the humanitarian assistance system. The piecemeal reforms show that the deficiencies of the existing humanitarian system are being tried to be superficially corrected. However, the aim of the change should be to bring a new definition to the concept of help. IFRC currently struggles to pave a leadership role in humanitarian aid sector by embedding innovative technology and continuous development of staff members. INGO staff like the IFRC need to be able to answer critical questions such as what exactly AI is, how it can be used, what it can offer the humanitarian industry, whether it will trigger an industry-wide digital disruption that will challenge the dominance of the largest humanitarian organizations or serve to exacerbate the North-South divide.

A future where refugees can be granted digital asylum in other countries where they can do digital work and contribute to the growth of this economy without a heavy burden on host societies is something everyone aspires to. Therefore, we need to make sure that the data we produce is ultimately used to benefit the human sector, and we should be working to improve our data analytics capability and artificial intelligence algorithms (Oroz, 2017). During the IFRC 2030[1] strategy is achieved, there should be new structure for innovative technology that let everyone know job requirements to ensure that no one falls behind critical steps. For example, to the extent that AI can be used to empower citizens and affected communities in humanitarian crises, there will be nanosatellites that screen and warn every such thing in the world in detail, allowing us to generate near-instant insights into humanitarian crises. The digital revolution can help refugees protect their rights and identities and even create safe and healthy jobs by INGOs.

[1] For details of the Strategy, see: https://www.ifrc.org/who-we-are/about-ifrc/strategy-2030

Since the humanitarian aid system, in its current form both technically and economically is insufficient to resolve humanitarian crises effectively and efficiently, it needs reforms that will renew and transform itself to comply with technological requirements. This change is related to creating more realistic and innovative approaches to reasonably preventing and mitigating humanitarian crises that exist today and are likely to emerge like Syrian and Ukrainian crisis. Emergency aid and assistance in disasters are both to save lives and to ensure the immediate normalization of post-disaster life. The value of saving human lives is priceless and providing sustainability of sustenance resources like cash-based transfers comes second. Even if it is not possible to save lives when the effects of disasters on the economy are considered, the investment needed for AI-based robots should be considered well. The support of international funds for research and development efforts on this subject should be provided without hesitancy. Studies in Türkiye are still at the initial level but has a potential to make a surge with lessons learned from ESSN practice. Considering that we frequently encounter various disasters and urgencies, it would be appropriate to accelerate resource use and research and development on AI supported processes.

Data-driven AI technologies are gradually transforming the humanitarian field as they have the potential to support humanitarian actors. They apply a paradigm shift from reactive to forward-looking approaches to humanitarian action, as AI can contribute to humanitarian action in its three main dimensions: preparedness, response, and recovery. AI technologies can support humanitarian preparedness and related project management by analyzing large volumes of multidimensional data at high speeds, identifying variable patterns in data, making probable-reasonable inferences, and providing important information about the likelihood and impact of potential risks. These logical stages can be accomplished before a crisis or humanitarian disaster strikes. AI technologies can also offer a variety of opportunities to support effective humanitarian DREF responses, CEA, MEAL and PMER processes and promote recovery programs, particularly in protracted conflict situations such as Syria and Ukraine.

According to the literature knowledge, there are several AI-based initiatives in use:

- Preparing early warning and developing possible scenarios with deployed AI systems to predict population movements,
- Anticipating emergencies before they happen and increase them with early detection, warning, and prevention mechanisms.
- Making prudent decisions and acting faster in emergencies and assistance, thanks to real-time awareness of crisis situations.
- Reaching more people with the services and information they need such as education, guidance, mentoring on legal and health information.
- Optimizing limited human resources to focus on high priority work effectively and efficiently.
- Improving results and outcomes through real-time feedback on the effectiveness of programs and make suggestions for improvements.
- Identifying property damage and missing persons by mapping the regions affected by humanitarian crises, and
- Facilitating monitoring and reporting by informing humanitarian activities in the field.

However, if these systems are used without proper oversight, they can expose individuals' personal information to potential data breaches that could result in unnecessary cybersecurity risks and unexpected fines. Accordingly, humanitarian organizations should keep in mind that there is no ready-made, "*one-size-fits-all*" AI solution that can be applied to all contexts and cash-based assistance projects to reap the benefits while outweighing the risks. They should also consider whether AI systems can be deployed in certain situations, as

such systems may do more harm than good to their beneficiaries and program stakeholders if not properly engineered. In some cases, just because technology is available does not mean it should be used in all circumstances. Thus, when deploying these technologies, it is crucial that the IFRC, as a champion INGO should try to establish adequate frameworks to strengthen ethical commitment, accountability, and transparency in the use of artificial intelligence in the humanitarian context and governance with stakeholders soon.

References

Adıgüzel, S. (2022). Afet durumlarinda yapay zeka teknolojisi ile lojistik yönetimi örnekleri. *Bitlis Eren Üniversitesi İktisadi ve İdari Bilimler Fakültesi Akademik İzdüşüm Dergisi, 7* (1), 47-70. Retrieved from https://dergipark.org.tr/en/pub/beuiibfaid/issue/69148/1057267

Aiken, E., Bellue, S., Karlan, D. *et al.* (2022). Machine learning and phone data can improve targeting of humanitarian aid. *Nature*, https://doi.org/10.1038/s41586-022-04484-9

Ali, M. (2021). Artificial intelligence could stop millions from going hungry by 2030, *Euronews Eco-Innovation*, https://www.euronews.com/green/2021/06/30/could-artificial-intelligence-stop-840-million-people-from-going-hungry-by-2030

Aoukar, Y. (2019). Can AI help save our children from online sexual abuse?, https://www.centreforpublicimpact.org/insights/can-ai-help-save-our-children-from-online-sexual-abuse#nav-1

Apps, P. (2019). Commentary: Are China, Russia winning the AI arms race? Reuters, https://www.reuters.com/article/us-apps-ai-commentary/commentary-are-china-russia-winning-the-ai-arms-race-idUSKCN1P91NM

Arkin, R., (2015). Communications of the ACM, Viewpoints, DOI:10.1145/2835965, https://www.cc.gatech.edu/ai/robot-lab/online-publications/308_V5812_VP_PCPREVArkinREV.pdf

Axe, D. (2019). This video might be the future of russia's army: armed ground robots. *The National Interest*, https://nationalinterest.org/blog/buzz/video-might-be-future-russias-army-armed-ground-robots-48022

Bakır, Z. Z. (2016). Küresel insani yardım sistemi ve değişim ihtiyacı, INSAMER, https://insamer.com/tr/kuresel-insani-yardim-sistemi-ve-degisim-ihtiyaci_373.html

Bennet, C. (2016). *Humanitarian Policy Group,* "Time to Let Go: A Three-Point Proposal to Change The Humanitarian System," April.

Çapan, F. (2021). Olanı engelleyemiyoruz (şimdilik) ama ya sonuçlara etki edebilirsek?, https://ayayderliderlikokulu.org/2021/06/06/olani-engelleyemiyoruz-simdilik-ama-ya-sonuclara-etki-edebilirsek/

Cassidy, M. (2020). Oakland police have 1,200 untested rape kits, second most in California, audit finds. *San Fransisco Cronicle*, https://www.sfchronicle.com/crime/article/ Audit-finds-Oakland-police-have-1-200-untested-15271265.php

Coppi, G., Moreno Jimenez, R. & Kyriazi, S. (2021). Explicability of humanitarian AI: a matter of principles. *Int J Humanitarian Action 6*, 19 https://doi.org/10.1186/s41018-021-00096-6

Cox, M. (2019). Army looking at ai-controlled weapons to counter enemy fire. Military, https://bit.ly/2zg9q2w

Cunningham, O. (2012). The humanitarian adi regime in the republic of NGOs.

Dindarik N. & Fidan Y. (2020). Türkiye'de mültecilerin yaşadıkları bölgelere yönelik insani yardım lojistiği: Kızılay örneği. *Manisa Celal Bayar Üniversitesi Sosyal Bilimler Dergisi Manisa Celal Bayar University Journal of Social Sciences*; *18* (2), 135-154.

DLR, (2021). Humanitarian aid with uncrewed aircraft and artificial intelligence, https://www.dlr.de/content/en/articles/news/2021/01/20210208_launch-of-the-drones4good-project.html

DuBois, M. et al. (2015). The Ebola Response in West Africa: Exposing the Politics and Culture of International aid. https://odi.org/en/publications/the-ebola-response-in-west-africa-exposing-the-politics-and-culture-of-international-aid/

Duffield, M. (2007). Development, Security and unending war: governing the world of peoples, Cambridge: *Polity Press*.

Hornyak, T. (2017). Mapping dengue fever hazard with machine learning. *Eos*. https://eos.org/articles/mapping-dengue-fever-hazard-with-machine-learning (updated 14 June 2017). 10.1029/2017EO076019

Huang, K. (2019). China's Sky Hawk stealth drone has the capability to 'talk' to fighter pilots, developer says, SCMP, https://www.scmp.com/news/china/military/article/2181731/chinas-sky-hawk-stealth-drone-has-capability-talk-fighter-pilots

Imran, M., Ofli, F., Alam, F., & Qazi, U. (2020). Using Artificial Intelligence and Social Media Multimodal Data for Humanitarian Aid.

Intell (2020). Türkiye'nin yardım politikası uluslararası rolüne işaret ediyor, https://www.intell4.com/kamu-diplomasisi-nedir-turkiyenin-yardim-politikasi-turkiyenin-yardim-ettigi-ulkeler-tika-ne-is-yapar-haber-185390

Joshi, N. (2018). 4 ways global defense forces use ai. *Forbes*, https://www.forbes.com/sites/cognitiveworld/2018/08/26/4-ways-the-global-defense-forces-are-using-ai/#7e9d8703503e

Kalkan, E. (2009). "Here is the Reality of Darfur", http://www.hurriyet.com.tr/iste-darfur-gercegi-13122856

Kissos L, Goldner L, Butman M, Eliyahu N, Lev-Wiesel R. (2020). Can artificial intelligence achieve human-level performance? A pilot study of childhood sexual abuse detection in self-figure drawings. *Child Abuse Negl. 2020 Nov;* 109:104755. doi: 10.1016/j.chiabu.2020.104755. Epub Oct 16. PMID: 33075702.

Köksoy, F. (2017). Uluslararası Kızılhaç komitesi'nin faaliyetleri ekseninde insani diplomasi. *Batman University Journal of Life Sciences*, *7*(1).

Lee, E., (2018). Yapay zeka açlık sorununu çözer mi?, amerikanın sesi, https://www.amerikaninsesi.com/a/yapay-zeka-aclik-sorununu-cozer-mi-/4627595.html

Li, L. ve Tang, S. (2021). An artificial emergencylogistics-planning system for severe disasters. *Intelligent Transportation System.* 86-88. https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=4580551.

Malewar, A. (2019). US Army's next rifle could have facial-recognition technology, Techexplorist, https://www.techexplorist.com/u-s-armys-next-rifle-facial-recognition-technology/23782/

Meinetten J. (2017). AI is a game-changer in the fight against hunger and poverty. Here's Why. *HU Media Analysis* 2017/2018, https://hucmdmediaanalysis1718b.wordpress.com/2017/12/02/ai-is-a-game-changer-in-the-fight-against-hunger-and-poverty-heres-why/

MFA (2016). Turkish humanitarian Aids. http://www.mfa.gov.tr/turkiye_nin_-insani-yardimlari.tr.mfa

Microsoft (2022). AI for humanitarian action projects, https://www.microsoft.com/en-us/ai/ai-for-humanitarian-action-projects?activetab=pivot1:primaryr6

Misthi, A. (2021). Artificial intelligence could stop millions from going hungry by 2030, https://www.euronews.com/green/2021/06/30/could-artificial-intelligence-stop-840-million-people-from-going-hungry-by-2030

Mohamedou, M. (2014). "ISIS and the deceptive rebooting of al qaeda", *GCSP Policy Paper*, http://gcsp.ch.

Naval (2019). USMC gets final RQ-21A Blackjack unmanned aircraft system, https://www.naval-technology.com/news/usmc-gets-final-rq-21a-blackjack-unmanned-aircraft-system/

Oriel, A. (2020). Top 8 AI technologies to mitigate child abuse and child trafficking, https://www.analyticsinsight.net/top-8-ai-technologies-mitigate-child-abuse-child-trafficking/

Oroz, M. L. (2020). From big data to humanitarian-in-the-loop algorithms, *UNCHR Innvation Service*, https://www.unhcr.org/innovation/big-data-humanitarian-loop-algorithms/

Özen, F. (2017). Afetlerde robotların kullanımı. *TMMOB Journal,* https://www.emo.org.tr/ekler/09c7bd3514f9da1_ek.pdf?dergi=1106

Pandya, J. (2019). The Weaponization of artificial intelligence. *Forbes*, https://www.forbes.com/sites/cognitiveworld/2019/01/14/the-weaponization-of-artificial-intelligence/#4a35170b3686

Peck M., (2019). Forget stealth fighters or aircraft carriers: China will beat America with this. *The National Interest,* https://nationalinterest.org/blog/buzz/forget-stealth-fighters-or-aircraft-carriers-china-will-beat-america-62987

Reis MA, Ortega NR, Silveira PS. (2004). Fuzzy expert system in the prediction of neonatal resuscitation. *Braz J Med Biol Res*, 37, 755–64. 10.1590/S0100-879X2004000500018

Roth, M. (2019). Artificial Intelligence at the Top 5 US Defense Contractors, https://emerj.com/ai-sector-overviews/artificial-intelligence-at-the-top-5-us-defense-contractors/

Şen, G. & Esmer, S. (2017). Afet lojistiği bir literatür taraması. *International New Issues in Socials Sciences International Scientific Refereed Journal* https://www.academia.edu/36749745/AFET_LOJ%C4%B0ST%C4%B0%C4%9E%C4%B0_B%C4%B0R_L%C4%B0TERAT%C3%9CR_TARAMASI?auto=download&email_work_card=download-paper.

Staff, T. (2018). IDF using autonomous drone system to try to intercept Gaza kites, balloons. *The Time of Israel*, https://www.timesofisrael.com/idf-using-autonomous-drone-system-to-intercept-gaza-kites-balloons/

Swasdee, A., Anshari, M., & Hamdan, M. (2020, November). Artificial ıntelligence as decision aid in humanitarian response. *International Conference on Decision Aid Sciences and Application (DASA)* (pp. 773-777). IEEE.

Swetlitz, I. (2016). Watson goes to Asia as hospitals use supercomputer for cancer treatment: PBS NewsHour.. http://www.pbs.org/newshour/rundown/hospitals-use-supercomputer-cancer-treatment/2017

ThinkTech (2020). Yapay zekâ savaşları başlıyor mu?, https://thinktech.stm.com.tr/tr/yapay-zeka-savaslari-basliyor-mu

Toplic, L. (2020). AI in the humanitarian sector, nethope report, https://reliefweb.int/report/world/ai-humanitarian-sector

Tzavella, K., Fekete, A., & Fiedrich, F. (2018). Natural hazardd opportunities provided by geographic ınformation systems and volunteered geographic ınformation for a timely emergency response during flood events in cologne, Germany. *Natural Hazards,* 91(1), 2957.

UNWOMEN (2019). Using AI in accessing justice for survivors of violence, https://www.unwomen.org/en/news/stories/2019/5/feature-using-ai-in-accessing-justice-for-survivors-of-violence

Wahl, B., Cossy-Gantner, A., Germann, S., & Schwalbe, N. R. (2018). Artificial intelligence (AI) and global health: how can AI contribute to health in resource-poor settings?. *BMJ Global Health, 3*(4), e000798. https://doi.org/10.1136/bmjgh-2018-000798

WHO, (2017). Dengue and severe dengue. http://www.who.int/mediacentre/factsheets/fs117/en/2017

Wieland ML, Wu ST, Kaggal VC, et al. (2013). Tracking health disparities through natural-language processing. *Am J Public Health*; 103:448–9. 10.2105/AJPH.2012.300943

Zhang, P., Guo, Z., Ullah, S., Melagraki, G., Afantitis, A. & Iseult, L. (2021). Nanotechnology and artificial intelligence enable sustainable and precision agriculture. *Nature Plants*, DOI: 10.1038/s41477-021-00946-6

Zhongming, Z., Linong, L., Xiaona, Y., Wangqiang, Z., & Wei, L. (2021). Humanitarian aid with uncrewed aircraft and artificial intelligence.

Zhu, X., Zhang, G., ve Sun, B. (2019). A comprehensive literature review of the demand forecasting methods of emergency resources from the perspective of artificial ıntelligence. *Natural Hazards, 97*(1), 65-82.