AI-Integrated Community Safety Solutions for Smart Cities: A Study Towards SDG 11

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***Abstract*— Safety in rapidly urbanizing cities like Chennai is becoming an increasingly difficult task as human populations and density of cityscape continues to grow, exposing the insulation of traditional measures in theft prevention, managing medical emergencies and fire hazards. The conventional approaches are usually reactive, fragmented and do not have real time coordination and integrated response resources. This paper shows the need for extremely advanced technological responses, namely AI based technologies, to deal with these urban safety problems. Across Chennai, 408 residents from different North, South, East and West regions had been included in a public opinion survey. The survey tried to find out about perceptions of the community safety, incidents of theft and gas leak, awareness about Sustainable Development Goals (SDGs) and open towards AI facilitated safety technologies. Results show varied perceptions for perceived safety, massive crime experiences, and major fears of gas leaks. Much is known about SDGs in general, with SDG 11 & SDG 9 in particular, but there is little awareness about what an AI can do to help reach these goals. This, however, is backed by strong support for AI driven enhancements in safety including smart alarms, surveillance systems and environmental sensors. The findings show that AI will play a critical role in enhancing community safety with real time monitoring, quick response mechanisms along with proaction of threat. It highlights how AI enabled safety technology can contribute to urban resilience and sustainability by setting the course of AI enabled smart home and community safety systems to resonate with the needs of urban residents and sustainable development goals.**

***Index Terms*-- AI-Integrated Safety Solutions, Community safety, Smart City Technologies, Sustainable Development Goals (SDGs), IoT-Driven Community Safety**

I. INTRODUCTION

Promising community safety in today's urban context has become a complex task, especially in fast-growing cities like Chennai as population density increases and population agglomerations develop into actual cities the new dynamic and more traditional approaches towards risk reduction become under pressure. Raising concerns about lack of solutions to fight theft, medical urgencies and fire risks situations. These issues not only pose threats to the welfare of its members but also compromise the general health of the society, a reason there is a need to address the issue with an importance of reviewing the current literature. Measures concerning safety and the application of high technological solutions.

Urban safety encounters significant threats such as theft, medical AEDs, and fire threats which are compounded by the restraints of old-style systems and confined spaces. One form of insecurity that has continued to rear its head is theft and here, commonly used security measures such as installation of barriers and Alert Neighbor type programs are inadequate for contemporary techniques. Likewise, medical emergencies also reveal that structural responses for handling emergencies are not efficient and timely because of the legacy technologies that remain prevalent, and understate the potential of AI-IoT solutions for constant vigilance as well as timely follow-up actions. Potential fire threats add to these challenges, considering that the fire protection systems are weak in urban centers like Chennai due to a weak infrastructure. Upgrading securities using artificial intelligence, sensors, and intellectual security systems can change urban security by improving the identifying and repelling mechanisms and emergency interventions. Though, this needs an elaborate approach that incorporates the following issues: How to foster coordination, the cost of deploying such a solution, and patient data protection that has been deemed critical.

Chennai's safety mechanisms are at present more or less isolated, and are only triggered at the onset of a danger, risk or emergency the security against theft, medical facilities, and against fires are in the main confined to siloed infrastructures, and as such, the comfort of the people living in the city is not well secured to its full potential. A synergy incorporating AI and IoT heralds a solution package that addresses data processing, pattern identification, and incidence forecasting in an augmented, speedier, and coordinated way. IoT devices still act to maintain a continuous monitoring and connection to keep safety systems alert with threats. However, challenges which will impede the deployment of both AI and IoT include lack of awareness, costs of implementation, and data privacy another sign that the uptake should be strategic and nonexclusive. The use of AI- IoT to strengthen community safety systems is in line with the United Nations Sustainable Development Goals (SDGs) agenda and will support SDG 11 that addresses targets 11.1, 11.3 and 11.8 aimed at affordable housing, inclusive and sustainable urban development and ways to strengthen urban- rural relations. This project improves safety, advisory and security from theft, medical

emergencies, and fire and is made possible by technology. It also contributes to SDG 9 for the inclusion of innovative and infrastructure facilities. Based on people's perception to safety risk, existence of daily accidents and awareness of SDGs in target communities, the study outlines areas that AI and IoT can be applied in enhancing safety solutions and ways to involve the community. The purpose of the findings is to offer practical strategies for designing and implementing safe, long-lasting, and livable cities and town environments and supporting the economic, social and environmental relationship between urban, peri-urban, and rural areas.

II. Literature Review

A. Community Safety

Community safety is one of the most emergent challenges in defining the safety of populations within contexts of urban areas where new risks and vulnerable elements arise. In general, the issue needs management solutions that would ensure the desired outcome. Recent studies have focused towards the various facets of safety with respect to a given community in the following way. New methods that can assist with enhancing safety measures against theft, diseases or fire outbreaks.

Lang (2014) described the function of Community Health as CHWs in promoting general health among the analyzing the situation and identifying ways to increase the enrolment rate in health insurance by increasing the participation of CHWs. Their work also addresses the need of doing intervention through community based in enhancing safety and wellbeing. To an effort to provide an answer to this question Higgins (2013) produced a spatial model of fire. Prevention, emphasizing on the point that hazards are always specific. To minimize cases of wrong identification of vulnerable groups in the concerned community. Chien (2007) provided a detail larger scale of fire behavior that divides the fire behavior into further categories. Preventions measures based on Taipei City Fire Department, it's major focuses included reducing the frequency of fire incidences and fatalities in residential structures. These studies show that there is an increased consciousness of the significance of this is why measures intended to improve safety have to be specific and clearly communicated with respect to the community issues.

Al-Hajj (2023) conducted a study of the Home Safe Fire Prevention Program by tracking the fire rates for twelve years and paid witness to the effectiveness of enhancing the fire safety measures in the society. Thus, the efficacy of results achieved within the context of this program indicates that extended and community-based approaches could prove beneficial in improving fire safety conditions. In like manner, Beringer (2000) aimed to establish Australia's bushfire risk perception and precautionary measures taken by the residents without sufficient information and participation. Shuka (2017) provided an overview of fire management issues in the developing countries with supporting call for development of enhanced abilities for disaster response and improvement of the international cooperation. In corporately, this sort of findings also emphasis that the community based and educate approaches are key in increasing safety.

B. AI & IoT in Community Protection

The AI integration in the industry and IoT can help in getting better control over the processes as well as mitigating the threats of failure. Here, the measures of integrating the Internet of Things (IoT) into the community safety systems could be regarded as a large stride to approach the problem of urbanization safety challenges. The discussions on the role of AI and IoT prove that these two belong without a doubt to the most significant trends of the present-day world. In order to create the necessary shift in how communities define organizational protect and respond to manage safety incidents.

Kerning (2017) presented a mobile device based biometric identified proposal based on proximity. PIN entry, and identification of incidence. Such as gunshots. In short, this system shows how Artificial Intelligence could enhance possibly new forms of identification and new ways to identify incidents to increase the standard of personal protection. For example, in smart homes technology reliant on AI coupled with IoT sensors, Varadarajan (2024) studied the use of AI in conjunction with IoT sensors to automate the elements of protection and energy consumption. It further necessitates for both AI and IoT to work in consort development or integration to boost the home security and to effectively manage the home resources. Reddy (2024) described how people can use AI and Arduino controller to control home appliance based on environment information and increase safety and efficiency through the application of robots as an automation.

In general, studies have been done to investigate the security vulnerabilities of other device types (In particular, IoT), meneghello (2019) as cited, base their emphasis on security and preventive actions to ward off as much as possible risks. According to Dawson (2009), based on interfaces and communication appliances, this method allows improving the coordination of responses to the events in a security cluster of structures. These such kinds of studies show that how AI and IoT are used across different industries as well as context like: through better such enhanced surveillance system automation and coordination to improve community safety. Chen (2021) constructs integration blockchain technology and IoT devices to advance community safety through the working of alarms and their recording in especially. Tamper-proof data storage. This focuses on the roles in understanding what the contribution of secure data management is to the emphasis on safety system reliability. Likewise, Fernandes (2016) had also carried out the analysis of the SmartThings smart home platform and vulnerability analysis of smart apps and device handlers as well as proposed improvements to the protective gear that is even more effective. Smart home requires a lightweight authorization stack (Chifor 2017). Request or a transaction made by a user can be more secure requests, as an IoT device tries to forward commands to a user's smartphone to make him authenticate or to approve action, or otherwise. These studies demonstrate the importance of the very strong security and protected information. management, which are necessary to resourceful deploying AI and IoT technologies.

C. Sustainable Development Goals (SDGs) Towards Safety Review

The combination of the use of AI and IoT in community safety requirements in integrated health information technology systems embraces several Sustainable Development Goals, especially those of urban area in specific Sustainable Development Goals (SDGs) dx specific Sustainable Development Goals (SDGs) development and innovation. Especially, the goal of Sustainable Cities and Communities

which has the number 11 in the list of SDGs. (Communities) stresses the importance of designing safe and sustainable communes. and efficient and sustainable urban setups. The use of advanced technologies to improve community safety caters to by enhancing the ways of handling the safety risks in achieving the above goal. promoting resilience.

Sager (2015) formulated a system that would help parse data information. multiple sensors to give alert when certain Aim at improving the safety of cities, consistent with criteria implementing Sustainable Development Goal 11. through technology. Likewise, Smith (2018) narrated alone of the wireless communication technique for handling messages presenting the time relationship between security devices and servers, with the special concern on link latency. and message storage. This approach supports SDG 9 To achieve the UN Sustainable Development Goal 9 (Industry, Innovation, and Infrastructure), the following strategy will be adopted leveraging technology for enhancing health care business as well as health care delivery system. safety systems. Parkin (2019) evaluated the feasibility and concerns that smart assistant technology poses to security of the survivors of tech abuse, discovering major usability problems that affect the reason from field to field is based on the real world concerning the efficacy of safety technology. This research we help enhance SDG 3 which is Good Health and Well-being. focusing on the topic of technology and safety. Rushanan (2014) analyzed security and privacy types and challenges, improvements for implantable healthcare equipment and body associated networks, that means paying attention to the security of software and sensor interfaces to safeguard the person's health information.

Bluth (2009) suggested means and ways of enhancing security features thereby personal records of individual health in the community health facilities aiming at kiosks. emphasizing the need to protect the data that is collected in improving the health-Related Safety. Donovan (2009) introduced an alert and monitoring system that is intelligent numerical and video inputs with the rule of machine learning for crime prevention and safety. This system contributes to the realization of SDG11 in the following way using IT to enhance the security within a community response capability.

To summarize, it can be seen from the literature that there is an increasing awareness of a need for higher technologies in order to solve community safety challenges. The integration of AI and IoT provides great opportunity to improve existing safety systems. while the association of SDGs enhances and assures the global orientation. on the applicability of these technologies to sustainable urban form. Subsequent research should extend knowledge of new and less investigated approaches in the sphere. solutions and to judge whether they facilitate or hinder the enhancement of functions and purposes such as community safety and of resilience.

III. Public Opinion & Survey Results

A. Demographic Overview

The survey carried out in the five zones of Chennai – North, East, Central, West and South received 408 responses that could shed light on safety concerns in those communities. The distribution of responses was as follows: North Chennai represented 30.4% of the respondents (124 responses), East Chennai represented 19.4% (79 responses), Center Chennai represent 18.6% (76 responses), West Chennai represented 14.2% (58 responses), and South Chennai represented 17.4% (71 responses).

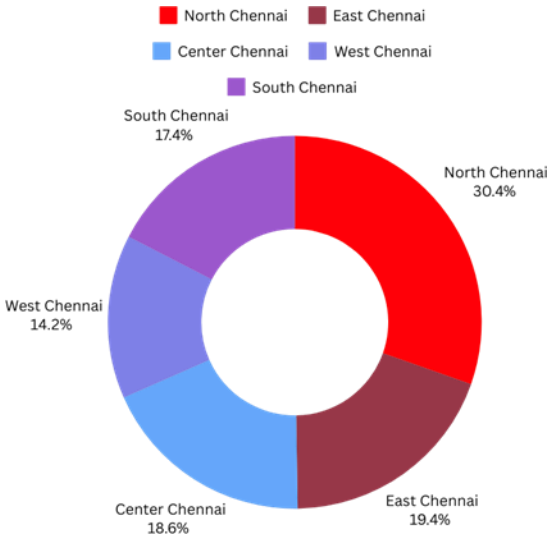


Figure 1: Responses by Geographic Region in Chennai Community Safety Survey

Therefore, North Chennai area should have presented more responses in terms of higher safety concern due to its contribution to nearly a third of the overall responses. This implies that there are differential safety risks in this area and possibly will need special approaches. On the other hand, East and South Chennai zones, with 19.4% and 17.4% of responses. Expressing significant safety concerns, but at a relatively lesser representation than North Chennai, 4% and 17.4% of the responses were noted. The two regions of Center and West Chennai still show considerable amount of response to Community Safety with 18.6% and 14.2% respectively.

Such variability in the distribution of responses to these regions suggests that people in these areas are subjected to dissimilar safety risks. According to the **Figure 1**, Analyzing the data collected from each area will make it easier when trying to analyze the different ways that we can help to enhance the community safety measures for all the residents in the Chennai.

B. Experiences with Theft

Out of all respondents 65.2% reported having been a direct victim or having known someone who has been a victim of theft and this highlighted a major insecurity issue that need to be addressed in most establishments. Notably, 83.5% of the respondents who dwelled on theft said the crime took place outside homes and not in homes themselves, therefore calling for involvement area safety measures. Additionally, 55.6% of participants reported experiencing gas leaks or expressed.

Figure 2: Incidence of Theft Experiences Among Survey Respondents

As shown in **Figure 2**, The received positive feedback on the effectiveness of AI based safety devices only supports the view of these technologies being useful in improving communal safety. All in all, these results depict severe safety hazards that require emergence of enhanced safety measures in Chennai.

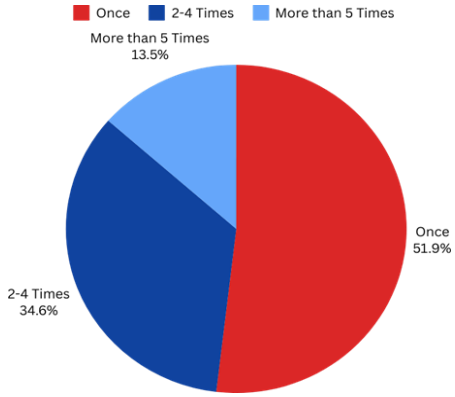


Figure 3: Frequency of Theft Incidents Reported by Respondents in the Community

As shown in **Figure 3**, The number of theft incidents reported was also quite high. Of the respondents who claimed to have fall victims to theft, 13.5 % of them said that such incidences had happened more than five time in the few years in their community. This was followed by 34.6% who reported incidents occurring 2-4 times, and 51.9% who experienced theft only once. These statistics further bring out the fact that theft issues in different societies are long-term, more so requiring hard and consistent efforts put in place for security measures to work effectively.

C. Identification and Communication of Theft

Different methods of identifying theft in the given communities came out in the responses and such disenfranchising reactions are some of the various facets of effort to ensure safety of such communities. The most common method was through reports from neighbors via physical communication, accounting for 33.8% of responses. This goes to show why much emphasis on direct neighborly surveillance in cases of theft is deemed critical. Perceived by security guards, answers 22.9% of respondents; while focus on importance of security guards in observing and reporting potential theft incidents took light. Among thefts 28.2% involved personal observation showing that a significant portion of the community relies on the incident. Communication through phone calls with neighbors was used in 11.3% of cases, barking dogs, as an example of an extralegal method of detection, were used in 3.8%. As seen in **Figure 4**, This data refutes a reductionist approach to theft detection, in which there are part and parcel a combination of structural and informal prevention styles.

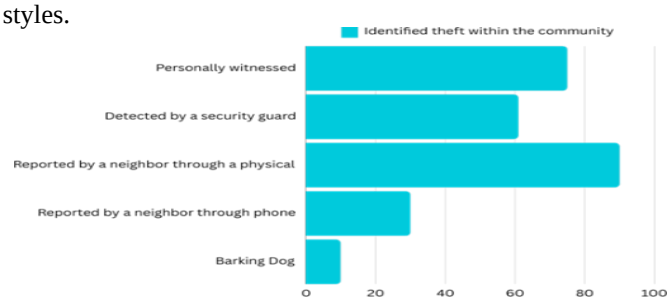


Figure 4: Methods of Theft Identification Reported by Respondents in the Community

Out of all the response options regarding to means of reporting theft, the largest number of respondents (48.1%) preferred to call the nearest neighbor directly. This was followed by using social media and community apps to inform everyone (9%). Other methods included communicating through phone to nearby neighbors (18.4%) and calling the police (24.4%). As illustrated in **Figure 5,** The use of direct and highly localized forms of communication as preferred illustrates the availability of timely methods to pass information on theft instant in neighborhoods

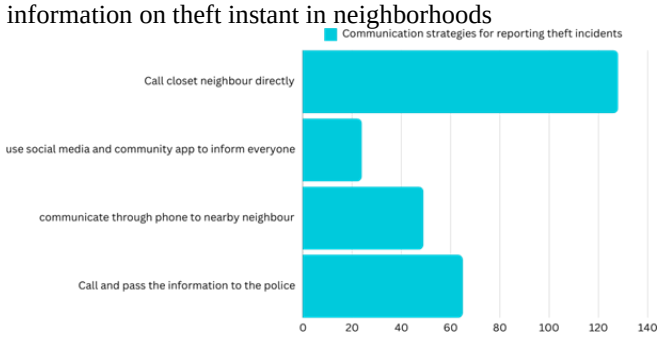
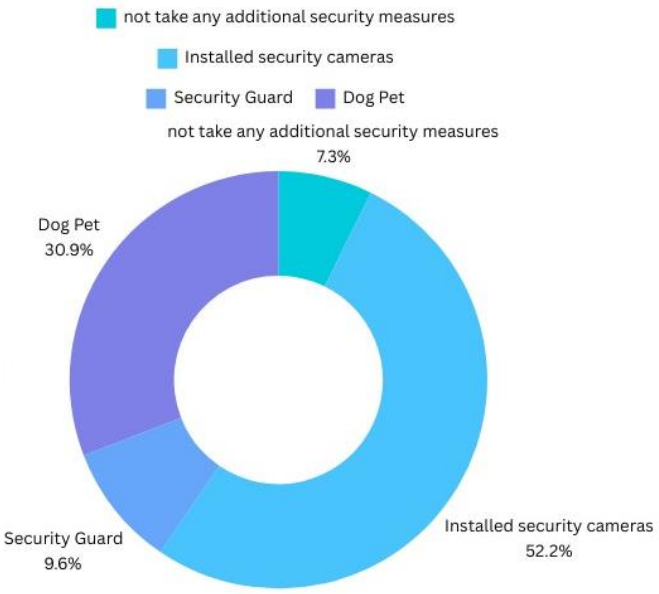


Figure 5: Preferred Communication Strategies for Reporting Theft Incidents

D. Additional Security Measures

When asked in a survey whether they have done anything extra after theft incidents, only 66.9% of respondents have. Of those that did, the most popular ones were security cameras (52.2%), employing security guards (9.6%), and using pet dogs for security (30.9%). A home security system was another feature found significantly less frequently, with the 7.3% of the respondents having it. The equally high rating given to security guards and even more emphasis laid on cameras can be interpreted as a preference for active safety increasing objects and personnel. As illustrated in **Figure 6&7** security guards and dogs show that Nuru has a strong inclination towards individual security assessment, and control as opposed to mechanical security measures.



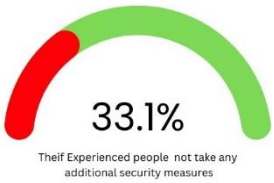


Figure 6 & 7: Security Measures Taken by Respondents After Theft Incidents

E. Awareness and Concerns about Gas Leaks

The survey investigated community's attitudes towards actual gas leaks and found out that 55.6% of the participants reported to have Come across with the menace of gas leaks in their home. Asked how concerned they are about the leakage of gas 72.8% said they are very concerned while 17.9% said they are concerned. 4.9 percent were non-committal and another 1.5 percent could be categorized as marginally concerned. Notably, 2.9% of participants were "not concerned," As shown in **Figure 8**, which highlights a widespread anxiety about this hazard.

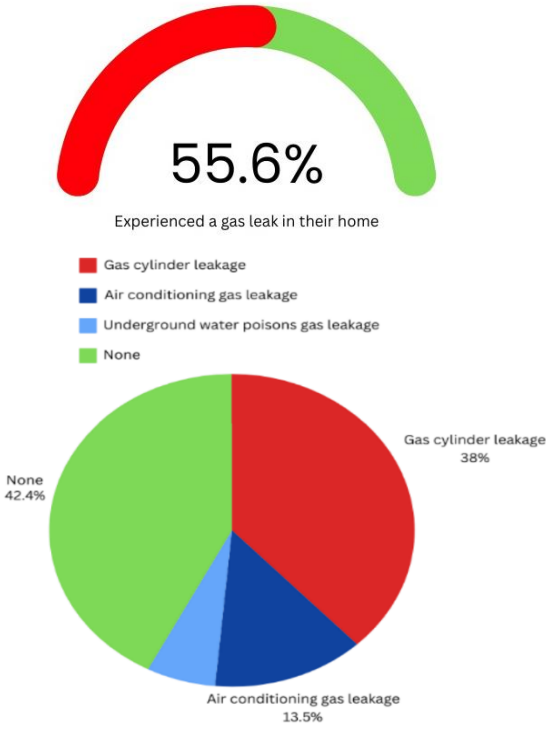


Figure 8 & 9: Respondents' Experiences and Concerns Regarding Gas Leaks

The data also shows variability in the types of gas leaks reported. 38% of respondents experienced cylinder leaks, 13.5% reported air conditioning leaks, and 6.1% encountered underground gas leaks. This variation makes it possible for there to be certain risks making their regions that influence the perception of the people towards gas leaks. For example, areas that register higher proportion of gas usage see more leakages probably due to increased commercial or dominance in densely inhabited residential areas hence higher concern from the people. This is in agreement with the findings depicted in **Figure 9,** Thus, it underlines the need to develop proper objective safety programmers' in risky populations to mitigate the hazard of varying gas leakage.

F. Awareness of Sustainable Development Goals (SDGs)

The survey assessed the respondents' perception of the UN Sustainable Development Goals (SDGs) more specifically, the goals of cutting co2 emissions by 2030. Shockingly, 85.3% of respondents never heard of these goals, which shows a lack of awareness relating to sustainable projects. Among the few who were aware, the most favored SDGs included Zero hunger (SDG 2), Good Health and Well- being (SDG 3), Quality education (SDG 4), and Affordable and Clean Energy (SDG 7). As shown in **Figure 10**, The fact that respondents are not familiar with most of the goals reviewed earlier means that people, in general, require more education when it comes to SDGs and how they can enhance safety in their communities and preserve the environment.

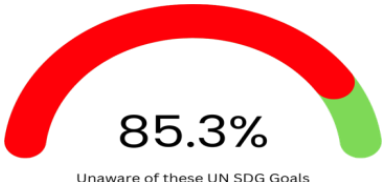


Figure 10: Respondents' Awareness and Preferences Regarding UN Sustainable Development Goals (SDGs)

G. Feedback on AI Integrated Community Safety Gadgets

The intended AI Integrated Community Safety Devices were the focal concern of the survey conducted aimed at gathering constructive opinions. The effectiveness of these devices was also high, where 67.4 per cent perceived these devices as highly effective, and 23.8 per cent seeing it as very effective. A paltry 2.2%-described them as being moderately effective, while 2% said they were not effective at all. This positive feedback informs a strong embracement of AI based safety solutions within the communities. Furthermore, 248 (79.7%) respondents stated their interest to undergo further testing or to provide more feedback, according to the results presented in **Figure 11.**

Figure 11: Respondents' Feedback on AI Integrated Community Safety Devices

IV. Proposed AI-CSD Project

A. Scope of the AI-Integrated Home and Community Protection System

The AI-Integrated Home and Community Protection System is expected to change community safety by establishing a functional prototype to prevent and respond to events like theft, fire, medical events, and poor air quality. This system embraces artificial intelligent (AI) and internet of things (IoT) technologies to help provide efficient emergency response in both the Urban and the Rural context.

System Overview: The prototype is smart devices placed ideally in homes to respond to emergencies by monitoring the environment. All the devices are operated both by buttons and voice, in the case of the emergency report, while

the set of the sensors includes voice and toxic air and fire detectors. It starts visual and audio alarms including bells and solar- charged lights should there be an emergency in informing the centr al community about the emergency. It also instantly sends a text message or a call to the police or an ambulance or fire-brigade and operates from a control room. As it is exemplified in Figure 12, Utilizing a serialized LAN based communication network, the devices guarantee that the signal does not stop even if one part is a loss.

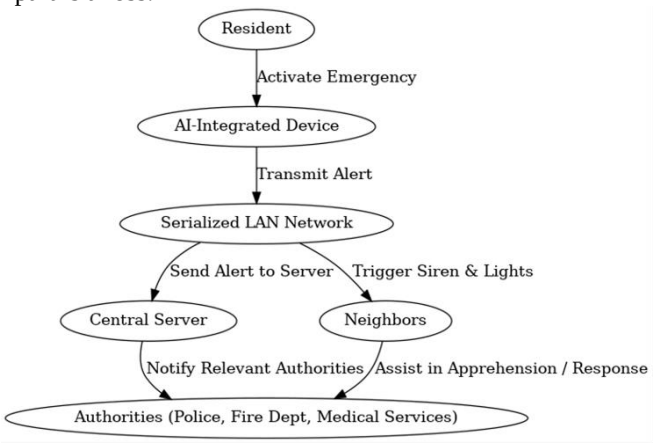


Figure 12: AI Integrated Community Safety Devices (CSD)Work Flow

B. **Key Features:**

- Emergency Detection:
  - **Manual:** Push buttons for reporting theft, fire, and medical emergencies.
  - **Voice Command:** Separate voice commands for each emergency situation (e.g., "Fire," "Thief," "Air," "Medical") to trigger the system if the user cannot press the buttons.
- **AI-Based Air Quality Monitoring:** Gas detectors such as the one used to identify the concentrations of carbon monoxide and problems such as leakages in air conditioning systems.
- **Community Communication Network:** Alerts neighbors and authorities through a serialized LAN network within a 1 km radius.
- **Siren and Solar-Powered Lighting:** Used to sound sirens and solar installed light in the neighboring compound to create awareness during emergencies.
- **Central Control Room Communication:** It listens to signals coming from the devices and sends messages to the emergency facilities.
- **Solar Power Supply:** It can function mostly through the use of solar power with an interface for plugging in a secondary source of power.

C. ***Importance of the AI-Integrated System:*** The integration of AI and IoT technologies in the AI-Integrated Home and Community Protection System brings forth numerous benefits, particularly in the context of achieving the Sustainable Development Goals (SDGs), including SDG 11 & SDG 3.

Comprehensive Emergency Response Mechanism: The smart device situated in the neighborhood basically includes a pouch of several buttons for system activation, and a Voice Recognition Module, which when pressed or used to report emergencies, allows fast response irrespective of the stressful state of the person in charge. Every device is equipped with basic sensors as follows; the MQ-135 Air Quality Sensor for detecting toxic gases, the Flame Sensor for fire detection and the DHT22 Temperature and Humidity Sensor for environmental checks. All these components ensure that a rich safety-net is developed thus improving he public health and safety.

Resilience and Community Engagement: A serialized LAN architecture of the Community Communication Network within the system guarantees that an alert will spread to neighbors and necessary authorities within a 1 KM radius even if one communication line is out of order. It also helps in the creation of partnership towards safety of the community since the residents can defend themselves against threats.

Alignment with Sustainable Development Goals: This project helps in the achievement several of the United Nations Sustainable Development Goals (SDGs) mainly for SDG 3 – Good Health and Well Being As a result of completing this project, you will be contributing the achievement of Targets 11.1, 11.3 and 8 under the United Nations Sustainable Development Goals (UN SDG) 11- Sustainable Cities and Communities which seek to provide access to adequate, safe and affordable housing, Goals of prompt emergency identification and reporting fit into SDG 3 because efficient medical intervention is important to save lives and enhance community health. Apart from rescuing the people's health from the threat of poor air quality, the AI-based monitoring also contributes to the achievement of another non-communicable goal formulated in SDG 11, which is to make the cities sustainable.

Effective Alert Systems: Visual Led by the Mini Buzzer/Speaker and the Solar-Powered LED Lights, the end-users receive alerts in both visions and hearings, notifying the households near them promptly of the emergencies. The central control room is a voice and message-sending center, which reduces the need for delay and increases the cohesiveness of communities when contacting emergency services.

V. CONCLUSION

Instead, the innovative Home and Community Protection System is an actual advancement in today's world to address the challenges in emergency management and protecting the members of the community. Based on over 408 individuals' structured questionnaires collected both online and offline, the current work contributes novel insights into the current state of community safety and effectiveness of the proposed technical solutions. According to the poll, over 65.2% of respondents had either experienced theft themselves or knew someone who had. This implies that theft is an issue that affects most people in their day-to-day life activities. Moreover, the frequency recorded for theft cases supports the need for an efficient security system. As we know, expanding the use of AI systems enhances the capability to discover and prevent theft, medical emergency cases, fire hazards, and air quality problems significantly. Some of these technologies are real- time data

processing technology, and automated alarm technology. Conversely, the study shows that a very high proportion of respondents, 55.6%, report that they either discovered gas leaks in their houses or are highly sensitive to them. This problem is directly solved by the AI Integrated System for the ability to track air quality and determine that substances are dangerous and provide instant alerts and precautions. Encouraging remarks with regard to the effectiveness of AI safety devices also support the possibility of a vast future influence on community safety. Subsequent development of the AI-Integrated Home and Community Protection System will focus on fine-tuning the design of the current prototype; increasing its scalability; and improving the caliber of voice recognition and the sensors involved in this project contribute to the realization of Targets 11.1, 11.3, and 11.8 of SDG 11 by promoting housing availability, and integrated urbanization, and bridging urban-rural divides. It calls for smarter, safer urban systems that can respond more nimbly and flexibly to meet the needs of the community while at the same time, the pursuit of the SDGs.

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