

2.2 Tools for post-pandemic restoration of community resilience

The COVID-19 pandemic has presented the global community with unprecedented challenges, profoundly impacting all areas of life. Local communities worldwide have faced disruptions that have not only exposed weaknesses in their social systems, economies, and infrastructure but also spurred the search for new ways to enhance resilience. The pandemic underscored the urgent need to restore and maintain a high level of resilience, addressing several critical factors. It demonstrated how rapidly global crises can escalate, affecting various aspects of community life and causing far-reaching socio-economic disruptions alongside health challenges. What began as a public health crisis quickly triggered severe economic consequences, including unemployment, reduced incomes, the decline of small and medium-sized businesses, and increased inequality in resource access. In this context, community resilience – the ability to adapt, recover, and continue functioning in the face of adversity – has become essential for safeguarding livelihoods and ensuring well-being.

The recurrence of pandemics is just one of many challenges confronting the modern world. Climate change, geopolitical conflicts, economic crises, and rapid technological shifts also threaten the stability of communities. To thrive, communities must be equipped to swiftly adapt and respond to a wide range of crises, extending beyond health emergencies (Xu et al., 2020). Resilience, in this context, serves as a critical strategy for long-term stability and preparedness in the face of unpredictable events (Gilbar et al., 2022). The post-pandemic era demands innovative approaches to strengthen community resilience and ensure stability amid constant change.

One of the most significant challenges of the pandemic has been the intensification of existing social issues, such as disparities in access to healthcare, education, and technology (Killam, 2022). Vulnerable groups (including the elderly, individuals with disabilities, low-income families, and ethnic minorities) have borne the brunt of these impacts (Fleming et al., 2024). Strengthening community resilience,

which involves creating robust social support systems and ensuring the inclusion of all members in recovery efforts, is crucial for addressing and reducing social inequality.

The pandemic had a profound impact on economic activity, with small and medium-sized enterprises being particularly vulnerable. Many businesses either suspended operations or significantly reduced their work due to lockdown measures (Johannsdottir & Cook, 2024; Johnson et al., 2022). These economic disruptions have highlighted the need for innovative approaches to local economic recovery. Besides, modern communities must consider adopting new economic models, such as green economy initiatives, digitalization, and support for socially responsible businesses. Community resilience is directly tied to the ability to revive businesses, generate employment, and promote sustainable development in evolving conditions (He et al., 2022). Strengthening post-pandemic resilience is essential to mitigating long-term negative consequences and ensuring future stability and growth.

Digital technologies have played a crucial role in mitigating the negative impacts of the pandemic on both the economy and social life. The crisis accelerated the adoption of digital tools across various sectors, enabling communities to respond more effectively to challenges and restructure operations around new technological frameworks (Alghamdi & Alghamdi, 2022). Digital platforms for resource management, remote work, virtual learning, and innovative healthcare solutions have become key pillars of post-pandemic community resilience (Shi et al., 2022). As such, the continued research and implementation of advanced technological solutions are essential for enhancing the adaptability and resilience of communities in today's rapidly changing environment.

The development of post-pandemic community resilience is heavily reliant on effective public policy and international collaboration. Governments and global organizations are implementing recovery strategies aimed at strengthening local communities, building sustainable infrastructure, and ensuring equitable access to resources (Jewett et al., 2021). Assessing the success of these initiatives is crucial for refining community support mechanisms and enhancing preparedness for future crises. Continued cooperation and strategic policymaking will play a pivotal role in fostering

long-term resilience and stability (South et al., 2020). However, crisis management operates across multiple levels – international, national, and local. The pandemic highlighted the critical role local communities play in supporting national and global stability. Effective crisis response at the local level can significantly reduce overall losses and accelerate recovery (Yi et al., 2023). The post-pandemic resilience of communities depends on their capacity to mobilize resources, sustain social cohesion, and adapt to evolving conditions. In this way, community resilience becomes a foundational element in fostering the broader sustainability of society.

Therefore, given the profound and far-reaching effects of the COVID-19 pandemic on communities, research into tools for building post-pandemic resilience is critically important. Such research will help identify effective strategies to strengthen community resilience, support economic and social recovery, and prepare for future crises. By understanding and implementing these approaches, communities can better withstand future shocks and ensure long-term sustainability and well-being.

2.2.1. The concept of community resilience

The term “resilience” has evolved across various fields and disciplines, carrying different meanings depending on its context. Initially, it originated in physics to describe the capacity of materials to return to their original shape after being deformed. Over time, the concept expanded into other areas, taking on metaphorical meanings. In psychology, for instance, resilience refers to an individual’s ability to withstand stress and maintain vitality. While the term gained prominence in the 20th century in fields like medicine, psychology, and ecology, its application has since broadened to include economics, sociology, and politics (Patel et al., 2017). The growing interest in resilience stems from the increasing instability of political systems, global economic crises, and the mounting risks posed by natural disasters and climate change. As a result, resilience has become an interdisciplinary concept, bridging diverse elements of both the natural and social sciences to address complex, multifaceted challenges.

The term “resilience” applies to both objects, such as in ecology and physics, and subjects, including individuals, communities, or entire societies, as seen in psychology, medicine, sociology, and economics. Broadly speaking, the resilience of

any system encompasses three essential traits: the capacity to absorb risks, adapt to changing conditions, and recover from disruptions (Meng et al., 2018). Risk absorption refers to the capacity to withstand adverse impacts, while adaptation involves adjusting to new conditions. Recovery is the system's ability to return to a stable and functional state after facing disruptions.

The concept of community resilience was first introduced by Judith S. Kulig in 2000, in a publication focused on healthcare development within communities (Kulig, 2000). In this context, the term has several unique features. First, communities are impacted by both external factors, such as natural disasters and financial crises, and internal factors, like social or political instability. Second, unlike individuals, communities possess distinct geographic, social, and political characteristics that shape their response to risks. Finally, community resilience directly influences the well-being of its residents, affecting their quality of life and the overall functioning of social processes.

Community characteristics such as economic development, infrastructure, political systems, communication networks, and geographic location form the foundation of their resilience. However, the literature presents varying perspectives on the components of community resilience, often shaped by the specific nature of the risk being examined (Fan & Lyu, 2021; Faulkner et al., 2018; Meng et al., 2018; Menzies & Raskovic, 2020). In the context of pandemic and post-pandemic development, researchers frequently highlight four key elements of community resilience: social capital, economic development, human capital, and physical resources. These elements collectively determine a community's ability to withstand, adapt to, and recover from crises.

Human capital encompasses the knowledge, skills, and leadership qualities that enhance a community's ability to effectively manage and organize its activities. This element reflects a community's capacity to leverage accumulated experience to prevent crises and mitigate their impact. Human capital also drives adaptation to new circumstances by applying expertise to implement change and foster growth. During

the COVID-19 pandemic, leadership in enforcing safety measures and mobilizing resources to address the crisis was a crucial aspect of human capital.

Social capital, which includes the community's social resources and cohesion, is a vital component of resilience, enabling collective action and support for shared decisions. It reflects the community's capacity for self-organization, mutual aid, and cooperation during crises. The COVID-19 pandemic highlighted the importance of social capital through volunteer initiatives, support for vulnerable groups, and widespread adherence to safety protocols, such as social distancing and mask-wearing, demonstrating the power of community solidarity in challenging times.

Physical resources and infrastructure are crucial elements of community resilience. During the COVID-19 pandemic, a community's ability to provide adequate healthcare services – such as hospitals, beds, and ventilators – proved essential. Beyond healthcare, the resilience of physical infrastructure, including transportation networks, communication systems, and housing, significantly contributes to a community's ability to withstand and recover from crises.

The economic dimension of resilience involves having sufficient financial resources to mitigate the effects of crises and support future development. Effective financial management enables a quicker response to emergencies while maintaining economic stability. During the COVID-19 pandemic, communities with stronger economic foundations were better equipped to address income losses, rising unemployment, and other economic challenges, helping them recover more effectively from the crisis.

Geographic location is another key factor in community resilience. Communities that are geographically isolated or experience low migration flows have shown greater protection against the spread of COVID-19. Isolation can act as a barrier, reducing exposure to pandemics and shielding communities from other external threats, such as natural disasters.

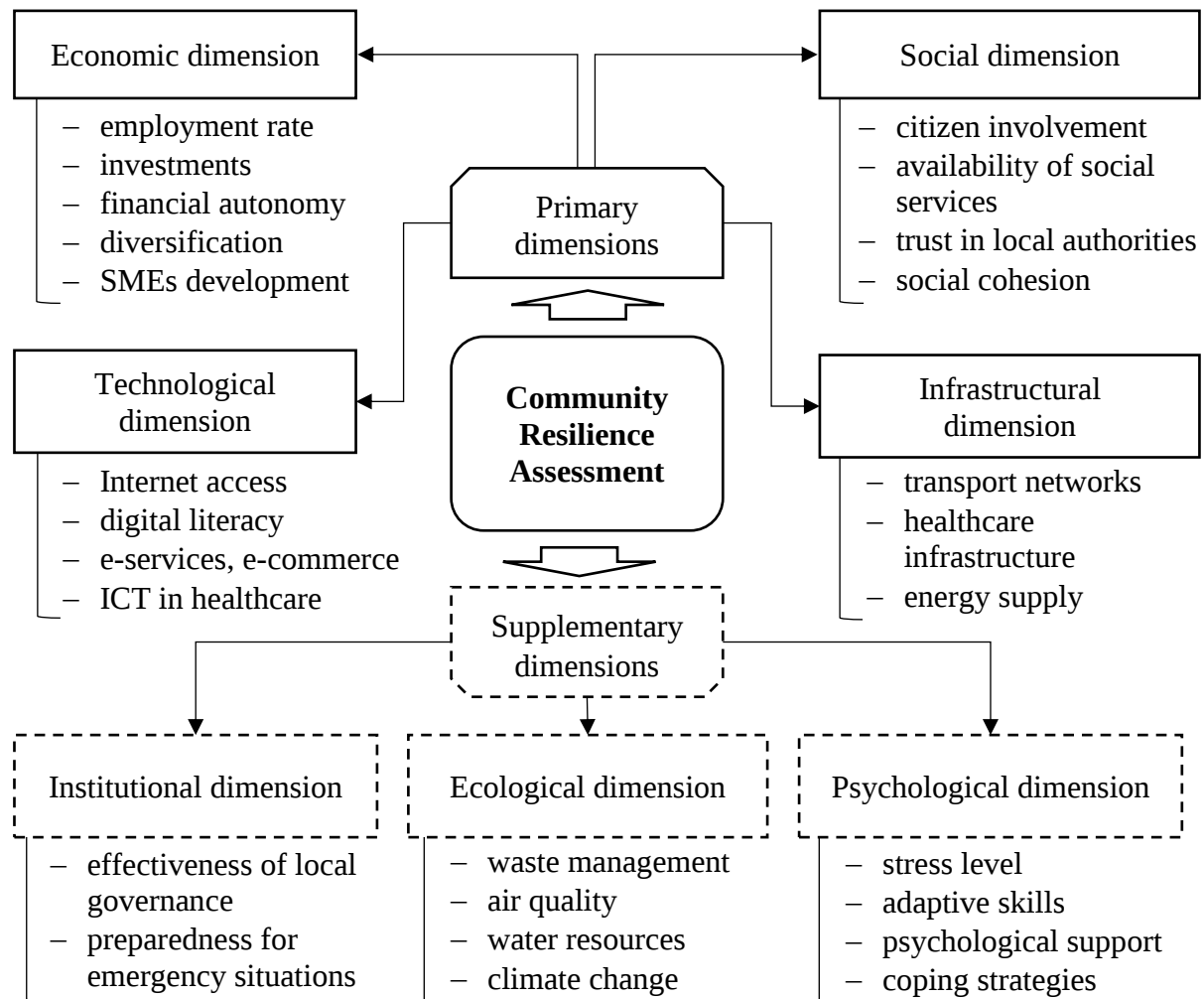
In summary, community resilience is a multifaceted concept that arises from the interplay of social, economic, human, and physical resources, alongside the geographic characteristics of the community. A well-balanced integration of these elements enables

communities to effectively respond to crises, adapt to changing conditions, and sustain long-term development.

2.2.2. Dimensions of community resilience assessment

Assessing community resilience requires a clear system of indicators to measure its level. One approach is to evaluate resilience through three key components based on its economic nature: adaptability, stability, and post-crisis recovery. Another method is to assess resilience by focusing on specific dimensions of community activity. In the academic literature, the list of areas and indicators for assessing resilience varies widely (Fenxia, 2022; Suleimany et al., 2022; Valinejad et al., 2022). For instance, Suleimany et al. (2022) analyzed 115 papers on community resilience and proposed an integrated framework for evaluating community resilience during the pandemic. The framework organizes indicators into five dimensions: institutional, social, economic, infrastructural, and demographic. Key institutional indicators include effective leadership, government support, planning, and the availability of skilled labor and equipment. Social indicators encompass communication, collective identity, mutual aid, security, and social justice. Economic criteria focus on the sustainability of the economy and resource availability. Infrastructure indicators cover services, public spaces, housing, and transportation. Finally, demographic resilience is assessed through factors like physical health, psychological well-being, quality of life, and hygiene. This multidimensional approach allows for a comprehensive evaluation of a community's ability to withstand, adapt to, and recover from crises.

The pandemic underscored the crucial role of information and communication technologies in enhancing community resilience and adaptability during crises. In the post-pandemic landscape, it's essential to fortify community resilience against a variety of potential threats beyond health risks. Therefore, we propose incorporating indicators of technological preparedness and ecological factors into the framework for assessing community resilience. These additions will provide a more comprehensive understanding of the potential challenges communities may face. Fig. 1 illustrates the identified dimensions for evaluating community resilience in the post-pandemic context.



Source: developed by the author

Figure 1. Dimensions of community resilience assessment in the post-pandemic period

The economic dimension is a cornerstone in assessing community resilience, as it determines the community's capacity to withstand and recover from economic shocks. Key indicators for evaluating economic resilience include employment levels, investment volume, financial autonomy of the local budget, economic diversification, and the development of small and medium-sized enterprises (SMEs).

Economic diversification enhances resilience by ensuring that a community is not overly reliant on a single sector, reducing vulnerability to crises in specific industries. For example, communities heavily dependent on tourism, hospitality, and the restaurant industry were significantly more financially vulnerable during the

pandemic. A high employment rate, particularly in sectors that can remain operational during crises, is also a critical marker of economic stability.

The ability to attract both external and internal investment reflects the economic attractiveness and development potential of a community, serving as a key driver for faster recovery in the post-pandemic period. Financial autonomy, which refers to the adequacy and mobilization of a community's financial resources, is another crucial factor. It allows for quicker responses to crises and the ability to address urgent needs independently.

Citizen involvement, the availability of social services, trust in local authorities, and social cohesion are essential pillars of social resilience and play a significant role in a community's ability to withstand and recover from crises (Valinejad et al., 2022).

Citizen involvement reflects the active participation of community members in decision-making processes, local initiatives, and volunteer efforts. High levels of engagement contribute to more responsive governance, as residents collaborate to find effective, locally relevant solutions. Encouraging civic participation strengthens the social fabric and fosters a sense of ownership and responsibility among community members.

The availability of social services ensures that communities can meet the basic needs of their residents, especially during crises. Key social services include healthcare, education, and social safety nets, which are critical for supporting vulnerable groups such as the elderly, low-income families, and individuals with disabilities. A strong network of accessible social services helps communities maintain stability, provide for their citizens' well-being, and reduce inequalities, particularly in times of crisis.

Trust in local authorities is a crucial element in building resilience, as it underpins the community's willingness to follow guidance and cooperate with crisis management efforts. When residents trust their local government, they are more likely to adhere to public health measures, participate in recovery initiatives, and support collective decisions. Trust fosters collaboration between authorities and citizens,

enhancing the effectiveness of crisis response strategies and long-term development plans.

Social cohesion refers to the degree of solidarity, mutual aid, and cooperation within a community. High levels of social cohesion mean that residents are more likely to support one another and engage in collective actions to overcome challenges. It strengthens the community's ability to self-organize, adapt to disruptions, and recover quickly. During crises like the COVID-19 pandemic, strong social bonds were evident in volunteer efforts, community support systems, and collective compliance with health measures.

In the UK alone, around a million people volunteered during the COVID-19 pandemic, with self-help groups emerging globally. Although international health guidelines underscore the importance of community participation, decisions during the pandemic were largely made by governments with limited engagement from local communities. However, involving communities – including vulnerable groups – can help address issues such as stigma, misinformation, and structural barriers. Past experiences, such as the fight against HIV/AIDS and the Ebola virus, demonstrate that community involvement is crucial for effective crisis response. Despite the difficulties, public participation must remain central to any sustainable and successful crisis response (Marston et al., 2020).

Research by Mao et al. (2021) highlights that the most common volunteer activities during the pandemic included grocery shopping and providing emotional support. Various models of volunteering emerged, with support groups adapting their activities to meet changing needs. The majority of volunteers were middle-class, highly educated women of working age. Social connections, local knowledge, and trust played key roles in the organization and success of these volunteer efforts. Social cohesion is thus a fundamental component of resilience, enabling communities to face adversity together.

The availability of developed infrastructure is a critical factor in ensuring a community's resilience, particularly in the post-pandemic period. Key indicators of

infrastructural resilience include the development of transportation networks, the quality of healthcare infrastructure, and the availability and reliability of energy supply.

A robust transportation network is essential for maintaining access to public and private transportation, ensuring the mobility of the population, and supporting the continuous flow of goods and services during a crisis. The level of transportation development can be assessed by indicators such as the number of public transport vehicles per 1,000 people, the inclusivity of transport services, the availability of discounted fares for vulnerable populations, the stability and reliability of transportation schedules, and the frequency of public transport services.

The quality of healthcare infrastructure is another fundamental element of resilience. It can be measured by the availability of medical services (number of healthcare facilities per 1,000 people, the ratio of doctors and medical staff to the population, the accessibility of specialized medical services, and the proximity of residents to healthcare facilities); the availability of medical equipment and access to medications (including ventilators, diagnostic tests, and vaccines, that were especially crucial during the pandemic); overall quality of healthcare services (mortality rates, complication rates after medical interventions, average waiting time to see a doctor).

Energy supply availability and stability are also key to community resilience. This encompasses constant access to electricity and other essential resources required for the community's functioning. Relevant indicators include the electrification rate, reliability of the energy grid (frequency and duration of power outages), the affordability of electricity for end users, the system's reserve capacity, the share of renewable energy sources in the overall supply, and the diversification of energy sources. These factors contribute to ensuring that communities can maintain critical operations and adapt to crises effectively.

In the modern era, information and communication technologies (ICT) have become a critical component of community resilience, enabling people to remain connected, work remotely, and respond swiftly to crises. Key ICT indicators that assess their effectiveness during emergencies and in the post-pandemic period include:

- the level of Internet access (the proportion of households with broadband Internet access, Internet speed, the availability of mobile Internet);
- the level of digital literacy of the population (the percentage of the population possessing basic ICT skills, the availability of educational programs aimed at improving digital proficiency);
- the development and availability of e-services and e-commerce, including the development of e-governance (the number and accessibility of government services available online), distance education services (the availability of the distance learning platforms); e-commerce (the percentage of SMEs that have transitioned to e-commerce, the proportion of the population regularly using online shopping and delivery services);
- ICT in healthcare (the percentage of medical services provided through telemedicine, the number of healthcare institutions utilizing electronic medical records, the availability of platforms for disease monitoring and contact tracing such as COVID-19 apps).

These ICT indicators not only reflect the technological infrastructure of communities but also demonstrate their preparedness to adapt to new conditions and maintain essential functions during crises like pandemics.

Additional dimensions for assessing community resilience in the post-pandemic period include institutional resilience, environmental resilience, and psychological resilience. Research by Liang et al. (2024) reveals that urban centres with high population density exhibited the greatest public concern regarding the pandemic. Notably, the most pronounced reactions were recorded during periods of stringent control and preventive measures. This study underscores the varying responses of individuals from different backgrounds and highlights the pandemic's multifaceted impact on daily life.

In this context, the psychological component emerges as a critical factor in sustaining community resilience. Key indicators for evaluation in this area include: level of stress (measurement of both acute and chronic stress levels within the community); availability of psychological support services (assessment of the

accessibility and effectiveness of mental health resources, such as counselling centres and hotlines); adaptive skills (evaluation of the population's capacity to cope with change, including problem-solving abilities and resilience training); awareness of coping strategies (measurement of how well-informed individuals are about effective coping mechanisms and stress management techniques).

By focusing on these psychological indicators, communities can better understand their overall resilience and identify areas for improvement, ultimately fostering a more supportive environment for all residents.

The primary indicators of ecological resilience in the post-pandemic period may include:

- air quality indicators: these assess the level of air pollution by measuring concentrations of fine particulate matter, carbon dioxide, nitrogen oxides, and other harmful substances. Regular monitoring of air quality is essential for evaluating environmental conditions and the associated risks to public health;
- waste management indicators: these encompass metrics such as the amount of solid household waste generated per capita, the rate of waste processing and disposal, the availability of infrastructure for waste sorting, and the proportion of waste that is recycled instead of sent to landfills;
- water resource indicators: these focus on water quality, accessibility to water resources, and the rational use of water within the community;
- preparedness for climate change: this includes evaluating the community's readiness for extreme weather events and the availability of strategies for climate change adaptation.

Indicators of institutional resilience within communities encompass several critical aspects, including the level of emergency preparedness. This includes the existence of crisis response strategies and plans, such as early warning systems and emergency evacuation protocols. Another vital indicator is the effectiveness of local governance, which reflects the ability of local authorities to respond swiftly to changes and make decisions that support the community during crises. Additionally, the level of transparency and accountability is essential; this involves having clear decision-

making processes and government reporting practices that foster trust and engagement between authorities and the community.

Thus, community resilience in modern conditions depends on a wide range of factors, including social, economic, infrastructural, technological, and other dimensions. A comprehensive assessment of these indicators enables an accurate evaluation of how well a community can respond to challenges and adapt to future changes.

A study by Fenxia and Wei (2024) revealed that the assessment of community resilience in 2022 showed a decline compared to 2020. This decline was largely attributed to more severe cases of infection and stricter quarantine measures. Despite these challenges, resident participation in risk mitigation activities and active engagement with the community consistently supported resilience.

In 2022, local organizations and volunteer group involvement had a particularly positive effect on community sustainability. Additionally, the availability of government services and sufficient reserves played a crucial role in maintaining resilience. However, the spread of COVID-19, or contact with infected individuals, had a negative impact on resilience, while economic conditions did not significantly affect the overall resilience levels. The decrease in resilience ratings in 2022 was primarily due to issues in communication, risk management, and inadequate resource allocation at the local level. Based on their findings, the authors recommended several key actions: improving communication to rebuild trust in government institutions, enhancing community resource management capabilities, leveraging high-risk situations to foster greater social cohesion, and improving essential services and emergency preparedness resources (Fenxia & Wei, 2024).

2.2.3. Strengthening community resilience in the post-pandemic period

The traditional control-oriented development model, which emerged from the modernist visions of the post-1945 era, is increasingly being challenged by the complexity and unpredictability of contemporary global crises. The COVID-19 pandemic has underscored the need to redefine development on a universal scale, prioritizing social protection, sustainable livelihoods, informal economies, and

universal healthcare. This crisis presents a unique opportunity for transformative change that addresses deep-rooted power imbalances and embraces the inherent uncertainty, diversity, and complexity of modern challenges. Without such fundamental shifts, future crises are likely to deepen existing vulnerabilities and inequalities, further straining global systems (Leach et al., 2021).

The post-pandemic recovery phase offers opportunities for devising social and public health policies that channel resources to marginalized communities and support community resilience (Penkler et al., 2020). The COVID-19 pandemic highlighted the critical role communities play in supporting vulnerable populations. However, relying solely on local, bottom-up initiatives is insufficient for fostering effective recovery and resilience. A broader, more comprehensive approach is essential, one that integrates collaboration between the state, civil society, and various stakeholders to build resilience across ‘whole-of-society’. This requires a balanced blend of top-down and bottom-up strategies, fostering partnerships that address challenges collectively within an increasingly dynamic and interconnected world. Such a holistic approach ensures more sustainable, inclusive, and adaptive solutions to future crises (McClelland et al., 2022).

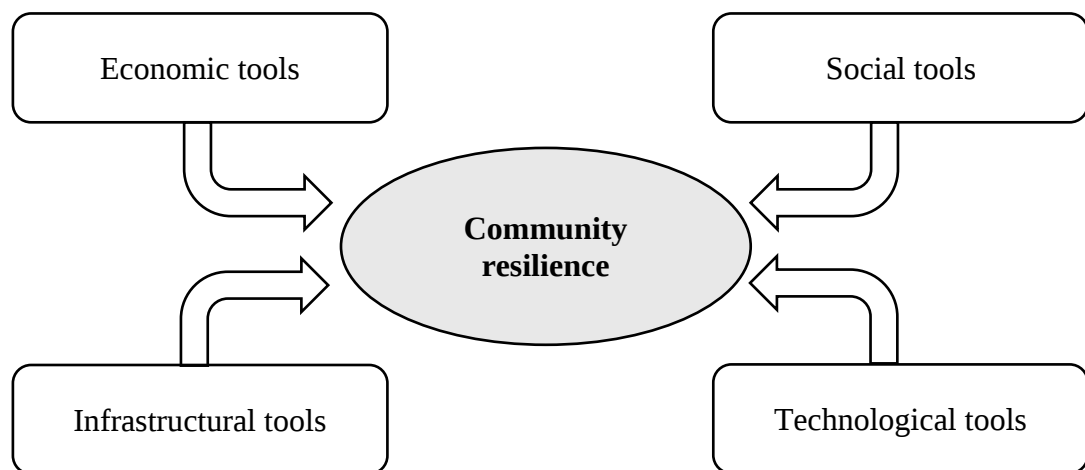
Fransen et al. (2022) identified key barriers hindering community initiatives aimed at strengthening resilience during the pandemic. These barriers included insufficient funding and resources, weak partnerships, and underdeveloped networks. Governments often played a limited role in these efforts, primarily due to capacity constraints, bureaucratic inefficiencies, and a lack of interest in collaborating with or supporting community-led resilience initiatives. In some cases, governments appeared to “delegate” their responsibilities, at least in part, due to their inability to adequately manage the pandemic’s challenges.

When analyzing post-pandemic recovery and community resilience, it’s essential to consider the principles outlined in ISO/TS 22393, which offers guidance on developing recovery and renewal strategies following a crisis like the COVID-19 pandemic (ISO/TS 22393, 2021). This document emphasizes both immediate and long-

term actions to restore operations and strategically enhance resilience for future challenges. Key Concepts from ISO/TS 22393:

- principles of recovery (experience analysis, assessment of readiness, restoring operations);
- principles of renewal (involvement of people, places, and processes, society-wide perspective);
- partners in recovery and renewal (national and local governments, communities, organizations, and individuals);
- recovery needs (humanitarian aid, economic stabilization, infrastructure, environmental considerations, communication, governance);
- cross-system themes (people, places, processes, power, partnerships);
- mechanisms for activation of recovery and renewal (planning, management, participation of partners, early-stage initiatives).

The inefficiencies exposed during the COVID-19 pandemic, along with the lessons learned from crisis response, provide a foundation for identifying key strategies to enhance community resilience. These strategies are crucial for preparing communities to withstand future crises and recover more quickly. By addressing weaknesses in coordination, resource allocation, and social support systems, communities can become better equipped to manage and mitigate the impacts of future disruptions. The primary tools for strengthening community resilience can be categorized into four key areas: economic, social, infrastructural, and technological strategies (Fig. 2). This holistic approach ensures that communities can effectively withstand and recover from crises by addressing multiple dimensions of resilience.



Source: developed by the author

Figure 2. Primary tools for strengthening community resilience in the post-pandemic period

2.2.3.1 Social tools for strengthening community resilience

Social measures play a crucial role in post-pandemic recovery strategies, helping communities not only address the immediate consequences of the pandemic but also enhance their capacity to adapt to future challenges. These measures focus on reinforcing social cohesion, supporting vulnerable populations, improving mental health, and ensuring access to essential social services. Below is an overview of the key social tools employed in rebuilding community resilience after the pandemic (Table 1).

Table 1.
Social tools for strengthening community resilience

Social tools for enhancing community resilience	Social measures to strengthen community resilience
Support for vulnerable population groups	– financial and material assistance for vulnerable groups – retraining and employment programs for vulnerable groups
Fostering community cohesion	– support for volunteer initiatives – development of mutual aid networks
Provision of psychological support and social adaptation programs	– psychological support programs – mental health awareness campaigns – crisis management training and development of adaptive skills
Ensuring the availability and quality of social services	– digitization of social services – enhancement of medical services – promoting inclusiveness and equality

Source: developed by the author

During crisis and post-crisis periods, a key priority is providing social support to vulnerable populations, including the elderly, families with children, people with disabilities, and the unemployed. Governments and communities offer assistance through subsidies, food aid, housing support, and various social services. Additionally, programs aimed at reskilling and upskilling those who have lost their jobs help them adapt to the evolving labour market, reducing social inequality and promoting social stability.

During the COVID-19 pandemic, many communities mobilized volunteers to assist vulnerable groups. Volunteer organizations played a crucial role in delivering medical care, distributing food, and organizing transportation for those in need. This movement has continued post-pandemic, strengthening community resilience through volunteerism and grassroots self-organization.

Communities are also fostering the development of informal support networks, such as neighborhood initiatives and support groups for families, the elderly, and people with disabilities. These groups provide additional channels of assistance and contribute to community cohesion, enhancing the ability to respond effectively to crisis situations.

The COVID-19 pandemic significantly impacted the mental health of the population due to isolation, stress, and economic instability. As a result, psychological support has emerged as a key social tool in restoring community resilience. Communities and government organizations are actively developing mental health programs, with a particular focus on vulnerable groups such as healthcare workers, displaced persons, and families who lost loved ones during the pandemic. These programs offer counselling, therapy, support groups, hotlines, and online psychological services.

In addition to direct mental health support, training programs and courses are offered to community members on stress management, resilience-building, self-care skills, and how to support others in crisis situations. Training also includes emergency preparedness, such as evacuation plans, first aid, and responses to natural disasters or

pandemics. This equips individuals with the skills to better handle future crises and fosters personal resilience.

The pandemic has also accelerated digitalization, allowing citizens to access social services remotely. For instance, in Ukraine, the “Diia” platform enables people to apply for social assistance, register children for school, and access online consultations. Another critical aspect of increasing service accessibility is investing in local healthcare infrastructure – expanding medical facilities, hiring more healthcare personnel, upgrading infrastructure, and purchasing equipment to enable rapid crisis response.

The pandemic has deepened social inequalities, making equal access to social, healthcare, and educational services a critical component of recovery efforts. Communities are developing inclusive policies that ensure all members of society – regardless of social status, gender, age, ethnicity, or physical ability – are supported. For example, initiatives are being introduced to provide people with disabilities access to remote learning and employment opportunities. Additionally, programs promoting equal access to medical resources, including vaccines and testing, remain essential.

A successful example of social security programs mitigating unemployment and economic stress during the pandemic can be seen in the Scandinavian countries (Norway, Sweden, Denmark). These nations have continued to develop inclusive social programs in the post-pandemic period, focusing on support for low-income individuals, the elderly, and the unemployed. Their strategies emphasize the expansion of social services to strengthen social cohesion (OECD, 2023).

In the UK, efforts were concentrated on assisting vulnerable groups such as the homeless, people with disabilities, and young people during the pandemic. A key initiative was the “Everyone In” plan, which provided temporary housing for homeless individuals during the pandemic and continues to offer support in the post-pandemic period, ensuring access to healthcare and employment opportunities (Cromarty, 2021).

2.2.3.2 Economic tools for strengthening community resilience

Economic tools play a vital role in post-pandemic recovery, focusing on restoring economic stability, promoting entrepreneurship, job creation, and providing

financial resources to mitigate the impact of the pandemic. Effective deployment of these tools enables communities to adapt more swiftly to new realities and strengthens their preparedness for future challenges. Below are the key economic tools that contribute to rebuilding community resilience in the wake of the pandemic (Table 2).

Table 2.

Economic tools for strengthening community resilience

Economic tools for enhancing community resilience	Economic measures to strengthen community resilience
Financial benefits and incentives	– tax benefits and deferral programs – government subsidies – recovery and support funds – support of local production
Encouragement of entrepreneurship and innovation	– preferential business lending schemes – grant programs for SMEs and startups – development of an innovation ecosystem – integration of digital solutions in business
Ensuring employment	– training and retraining programs – investments in job creation

Source: developed by the author

Financial support has been a key instrument in restoring the economic stability of communities post-pandemic. Governments worldwide have introduced numerous programs to provide financial aid to both businesses and citizens. For example, in the United States, the “American Rescue Plan” was implemented, offering direct payments to individuals, tax credits for SMEs, and investments in healthcare and education. The program also emphasizes job creation in the green energy sector, contributing to the long-term economic sustainability of communities (Brachman and Haskins, 2023).

In response to the pandemic, many countries provided temporary tax relief and deferrals to reduce the financial burden on businesses. Measures such as tax cuts or eliminations for small businesses, along with deferred tax payments, helped maintain cash flow for enterprises. Another significant area of government support involved subsidies for businesses affected by the pandemic, covering expenses like wages, rent, equipment purchases, or recovery efforts. For instance, EU governments introduced grant programs to safeguard jobs and support businesses during challenging economic conditions.

Governments are also promoting the development of local production of food, essential goods, and services to reduce reliance on global supply chains, which are vulnerable during crises. Local producers are receiving financial support, subsidies, and loans to expand their production capacity.

In addition, some countries have created dedicated funds to finance post-pandemic recovery initiatives. The European Union, for example, launched the large-scale “Next Generation EU” initiative, which includes a €750 billion fund to support economic recovery projects, with a focus on green and digital transformation (European Commission, 2022).

In the aftermath of the pandemic, governments and international organizations have actively invested in the development of startups and small businesses. These grant programs aim to create new jobs and foster innovation across various sectors, including technology, healthcare, and agriculture. A key support mechanism for entrepreneurs is the provision of low-interest loans with favourable terms, such as lower interest rates, extended repayment periods, and government backing. This enables entrepreneurs to reinvest in their businesses and drive job creation.

The post-pandemic period has also stimulated the growth of innovative ecosystems, including startups, incubators, and accelerators. These ecosystems are crucial for developing new technologies that enhance community resilience to future crises. For instance, investments in digital technologies, remote services, and production automation are strengthening local economies. Many companies have shifted to online platforms for commerce, service delivery, management, and communication, making them more agile and adaptable to changing market conditions. Governments support this digital transition through grant programs that promote business digitization and provide entrepreneurs with training in digital skills.

Ensuring employment and upskilling workers are critical steps toward restoring economic stability. The pandemic significantly altered the labour market, prompting many people to seek new career paths. Governments and communities are responding with reskilling and retraining programs to help workers adapt to new market demands. Programs focused on digital skills, green business practices, and emerging professions

in healthcare are helping individuals find employment in these growing sectors. Additionally, government investment in infrastructure projects, green energy, and digitalization is creating new job opportunities in industries poised for growth in the post-pandemic era.

2.2.3.3 Infrastructural tools for strengthening community resilience

The COVID-19 pandemic underscored the critical importance of reliable infrastructure across key sectors of community life, including healthcare, transportation, communications, and energy. Post-pandemic, infrastructure plays a pivotal role in rebuilding community resilience, serving as a foundation for both economic and social development. The primary infrastructural tools used to restore and enhance community resilience in the aftermath of the pandemic are detailed below (Table 3).

Table 3.

Infrastructural tools for strengthening community resilience

Infrastructural tools for enhancing community resilience	Infrastructural measures to strengthen community resilience
Modernization and expansion of healthcare infrastructure	– expanding the network of medical facilities – upgrading existing healthcare infrastructure – digitization of healthcare services
Development of transport infrastructure and enhancement of mobility	– modernizing transport infrastructure – expanding public transportation systems – promoting eco-friendly transportation options
Sustainability of energy infrastructure and promotion of green energy	– developing renewable energy sources – upgrading electrical grids – enhancing energy efficiency in buildings and businesses
Sustainable infrastructure for water supply and sanitation	– modernizing water supply systems – improving sanitation conditions
Development of digital infrastructure	– expanding access to broadband internet – building infrastructure for digital services – implementing smart community management systems

Source: developed by the author

The pandemic underscored the critical importance of a robust healthcare system to safeguard communities against large-scale crises. The post-pandemic recovery includes the construction of new hospitals, clinics, and medical centres in underserved regions, enhancing access to healthcare and strengthening community resilience.

Simultaneously, existing medical infrastructure is being modernized – hospitals are being equipped with state-of-the-art equipment, including ventilators, advanced ventilation systems, and laboratory tools – improving the quality of healthcare services. Governments are investing heavily in ensuring that medical facilities are better prepared to handle surges in patient numbers during future crises (Goniewicz et al., 2023).

Since the pandemic, the German government has significantly increased its healthcare investments. Key initiatives include the modernization of hospitals, expanding the medical workforce, and developing digital health services, which have improved access to healthcare even in times of crisis (Gerke et al., 2020).

Italy, one of the countries hardest hit by the pandemic, has bolstered its investment in primary care and preventive health measures. The strategy includes the deployment of mobile medical teams and the expansion of telemedicine services, enhancing the flexibility of the healthcare system to respond to future crises (Parotto et al., 2023).

In post-pandemic India, several initiatives have been launched to strengthen the healthcare system, including mass vaccination programs, expanding healthcare facilities, and investing in mental health support. Special programs have been developed to assist populations affected by lockdowns and economic challenges (Pramesh et al., 2021).

The integration of digital technologies into healthcare infrastructure has also enabled communities to better respond to emerging challenges. Telemedicine, electronic health records, and remote patient monitoring became essential tools during the pandemic and continue to expand, allowing patients to access medical consultations remotely, reducing physical contact, and increasing the availability of healthcare services.

Transport infrastructure forms the backbone of community mobility, a critical factor in crisis situations. In the post-pandemic period, investments in transport infrastructure have focused on upgrading roads, bridges, railways, and aviation facilities. Building new transport routes and reconstructing existing ones not only

improves access to medical facilities but also promotes economic development by better integrating communities with surrounding regions.

The pandemic highlighted the essential role of public transportation, particularly for individuals without access to private vehicles. Investing in safe, reliable, and efficient public transit systems ensures equitable access to services for all residents, reduces dependence on cars, and helps lower carbon emissions.

Additionally, the pandemic has acted as a catalyst for the adoption of eco-friendly transport solutions. Many communities are now expanding infrastructure for electric vehicles by installing charging stations, while also investing in bike lanes and pedestrian areas. These initiatives not only enhance community resilience to environmental risks but also contribute to a higher quality of life.

Post-pandemic strategies in numerous countries aim to reduce reliance on fossil fuels and advance renewable energy sources, such as solar, wind, and hydropower. Investments in the construction and modernization of green energy facilities enable communities to source power from environmentally friendly resources, contributing to both economic stability and sustainability.

Strengthening the reliability of electrical grids is equally critical for ensuring the uninterrupted operation of businesses, medical facilities, and public transport. Many countries are modernizing electrical networks to enhance their resilience against natural disasters and other disruptions.

In addition, post-pandemic investments are focusing on boosting the energy efficiency of residential and commercial buildings. This includes retrofitting buildings with improved insulation, installing energy-efficient heating and cooling systems, and integrating renewable energy sources for self-sufficient energy use. These efforts not only improve energy efficiency but also reduce costs and carbon footprints.

Sustainable water and sanitation infrastructure is essential for ensuring public health and maintaining basic living conditions. Many communities are investing in modernizing water systems to guarantee continuous access to clean water, which is particularly crucial during pandemics. Clean water is fundamental to maintaining proper hygiene and preventing the spread of diseases. Expanding sewage systems and

implementing effective waste management practices further protect against outbreaks of infectious diseases, thereby enhancing community resilience to crises.

The COVID-19 pandemic also accelerated the push for digitalization, highlighting the importance of internet access and digital services for the economic and social functioning of communities. A key focus of this digital shift is expanding high-speed internet access, especially in rural and remote areas. Reliable internet connectivity supports teleworking, distance learning, and the continued delivery of services during crises.

Governments and communities are increasingly investing in the infrastructure needed for digital services, including platforms that enable e-governance, remote education, and telemedicine. Communities with access to such services are better equipped to adapt to pandemics and other crises. Additionally, the adoption of innovative technologies, such as smart management systems for energy consumption, transportation, and water supply, boosts resource efficiency and prepares communities for future challenges.

2.2.3.4 Technological tools for strengthening community resilience

Technological tools are a vital component in rebuilding community resilience in the post-pandemic era, as they enable adaptation to new challenges, optimize resource management, and facilitate swift crisis response. The COVID-19 pandemic has significantly accelerated the digitization of various aspects of life, with technological solutions playing a crucial role in strengthening communities. The key technological tools used to enhance community resilience during the post-pandemic recovery are outlined below (Table 4).

Table 4.

Technological tools for strengthening community resilience

Technological tools for enhancing community resilience	Technological measures to strengthen community resilience
Digitization of public services and governance	– e-governance – digital platforms for citizen engagement
Adoption of Smart City concepts	– IoT technologies for urban infrastructure monitoring and management – intelligent transport systems – smart energy solutions

Continuation of table 4

Remote work and service technologies	– remote service provision – remote work infrastructure
Development of digital skills	– digital literacy training programs – online education and professional development
Big data and analytics for informed decision-making	– analytics for health monitoring – scenario modelling for development
Cybersecurity enhancements	– investments in cybersecurity – cyber hygiene training programs

Source: developed by the author

The development of digital platforms for delivering public services is a key component of post-pandemic recovery. E-governance enables citizens to access essential services, such as document registration, tax filings, and social service applications, remotely. This minimizes physical contact, enhances transparency, and improves the efficiency of public administration. Rapid communication with residents is crucial during crisis situations, and digital platforms (such as mobile apps and websites) facilitate real-time interactions between local authorities and the community, reducing uncertainty and addressing citizens' needs promptly.

The concept of “smart cities” revolves around leveraging innovative technologies to efficiently manage urban resources and enhance the quality of life for residents. By utilizing IoT (Internet of Things) technologies to monitor and manage city infrastructure, communities can optimize resource usage, respond more swiftly to emergencies, and lower infrastructure maintenance costs. For instance, smart sensors can track the condition of roads, water pipes, and electrical grids, as well as monitor energy and water consumption in real-time.

In the energy sector, the integration of smart technologies allows for more effective management of energy use, leading to cost savings and greater efficiency. Smart grids, for example, can adjust electricity supply based on current demand, reducing energy waste and enhancing sustainability.

Similarly, intelligent traffic management systems contribute to improved mobility, reduced congestion, and lower CO₂ emissions. Technologies like smart traffic lights optimize traffic flow, while GPS-equipped public transportation systems

enable real-time tracking, making commutes smoother and more efficient for the community.

The pandemic has reshaped how work is organized, and services are delivered, prompting many communities to adopt technological tools to support these new models. Facilitating remote work opportunities is crucial to maintaining employment during crises. Investments in infrastructure, such as high-speed internet and related digital solutions (video conferencing, collaboration platforms), are essential for sustaining both business operations and government functions. Expanding the ability to deliver remote services – whether medical, educational, or social – through online platforms has become a vital component in strengthening community resilience. For instance, telemedicine enables residents to consult with healthcare professionals remotely, which is especially critical during periods of heightened epidemic risk.

To ensure the successful implementation of these technological solutions, developing digital skills across the population is essential. Enhancing digital literacy helps individuals adapt to changes in the labour market and economic environment, making them more agile and competitive. Training in technological skills improves the workforce's ability to leverage digital tools effectively. Equally important is fostering digital competencies among civil servants in local governments. This not only improves the efficiency of public administration but also enhances the quality and accessibility of services provided to the community.

The utilization of Big Data and analytical technologies empowers communities to make informed decisions based on reliable forecasts. Analytical tools enable the prediction of how crisis situations will impact communities and help identify optimal strategies for mitigating risks. By leveraging data on population demographics, traffic patterns, and health statistics, communities can optimize resource allocation and respond swiftly to changing conditions. Big data technologies facilitate the monitoring and analysis of public health, enabling rapid identification of disease outbreaks and the prompt implementation of containment measures.

As digital tools continue to evolve, the need to protect data and infrastructure from cyber threats becomes increasingly critical. Rebuilding community resilience in

the post-pandemic landscape requires the implementation of modern cybersecurity measures to safeguard against hacking attempts and data breaches. Protecting state institutions, healthcare facilities, and businesses from cyber threats is essential for ensuring the stable functioning of communities. Additionally, educating community residents about fundamental principles of cyber hygiene is vital. This training helps reduce individual-level risks and fosters a culture of cybersecurity awareness within the community.

Post-pandemic recovery strategies for communities across various countries are grounded in a comprehensive approach that integrates economic, social, technological, and infrastructural measures. Nations are prioritizing the development of digital technologies, investing in health and social services, and emphasizing environmental sustainability. These efforts aim to enhance communities' resilience and preparedness for future challenges.

2.2.4. Strategies for post-pandemic recovery of community resilience in Ukraine

Contemporary post-pandemic strategies for restoring community resilience in Ukraine are being shaped by the dual challenges of the COVID-19 pandemic and the ongoing war with Russia. In light of these circumstances, community recovery necessitates a comprehensive approach that addresses not only economic stabilization but also social, healthcare, infrastructural, and environmental dimensions. Key focus areas include:

- economic recovery and support for local businesses;
- development of the healthcare system and preparation for future crises;
- social support and community cohesion;
- digitalization and innovation;
- infrastructure restoration;
- international aid and cooperation.

The Government of Ukraine has launched several initiatives to support SMEs. For instance, the “5-7-9%” program provides entrepreneurs with access to low-interest loans for business recovery and growth, contributing to the economic stability of local

communities. During the war, this program was adapted to assist businesses affected by hostilities or those that relocated to other regions of Ukraine.

Additionally, individual communities are actively attracting foreign investment to create new jobs, develop small enterprises, and restore infrastructure. Collaboration with international donors and EU technical assistance programs enhances local entrepreneurs' competitiveness and enables them to adapt to new conditions.

In the aftermath of the pandemic, the government of Ukraine is prioritizing investments in the modernization of hospitals and healthcare facilities. This strategy aims to enhance the accessibility of health services in remote communities, develop telemedicine, and strengthen the capacity of emergency services. These initiatives are designed to better prepare communities for future crises, including infectious disease outbreaks and other emergencies.

A crucial aspect of this strategy is the development of mental health support programs for individuals affected by the pandemic and the ongoing conflict. Initiatives are being introduced to provide psychological assistance, train medical personnel, and offer psychological support to military personnel and displaced individuals.

Given the significant displacement caused by hostilities, communities have become central hubs for assisting internally displaced persons (IDPs). They facilitate temporary housing, provide humanitarian aid, and support the integration of IDPs into new communities. Such efforts enhance the social resilience of communities as they adapt to emerging social challenges.

Moreover, the volunteer movement in Ukraine during both the pandemic and the war has played a vital role in the social support strategy. The self-organization of communities to assist vulnerable populations affected by the conflict, the establishment of volunteer centers, and the collection of funds and resources have all contributed to strengthening the social capital of these communities.

The Government of Ukraine is actively enhancing electronic services through the "Diya" platform, which enables citizens to access government services online, register businesses, and obtain necessary documents. This initiative not only improves

the efficiency of community management but also ensures stable access to public services during crises.

The pandemic has underscored the importance of distance education, prompting communities to develop digital learning platforms. This approach facilitates continuous education during quarantine or other emergencies and increases access to educational resources, particularly in remote areas.

Reconstructing residential buildings, roads, schools, and hospitals damaged during the war is a significant challenge for many communities. To address this, international investments and funding from global organizations are being leveraged. Restoring infrastructure is essential for reinstating the fundamental functions of communities and enhancing the quality of life for residents. As Ukraine rebuilds, considerable emphasis is placed on implementing principles of environmental sustainability. Infrastructure restoration projects prioritize energy-efficient technologies, green solutions, and climate change adaptation, ensuring the long-term sustainability of communities.

Financial assistance from the World Bank, IMF, EU, and other international organizations plays a crucial role in supporting Ukraine's community rebuilding efforts, including investments in healthcare, education, infrastructure, and economic recovery. Additionally, Ukraine is actively learning from the experiences of other countries in restoring community resilience, which includes training local government officials, integrating innovative methods into reconstruction processes, and developing social programs.

Conclusions

The COVID-19 pandemic has highlighted the critical need for communities to swiftly adapt to new challenges and maintain stability during crises. A wide array of tools – including economic, social, infrastructural, and technological interventions – are essential for building resilience. These measures not only facilitate recovery from shocks but also strengthen communities' capacity to face future challenges.

Key pillars of an effective post-pandemic recovery include economic support, investment in digital infrastructure, human capital development, social cohesion, and

robust public healthcare systems. These strategies enhance a community's preparedness for various types of crises, mitigate their negative impacts, and ensure sustainable, long-term development.

Resilience-building tools do more than restore normalcy after crises; they provide opportunities for further strengthening and growth. Thus, investing in these areas is essential for ensuring sustainable development and the continued success of communities in an increasingly interconnected and rapidly changing global landscape.

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