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Integrating Natural and Social Sciences for Urban Resilience and Sustainability

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

Because of the differences in lifestyles, livelihoods, ecological conditions, natural environment, and social environment, etc., between urban areas and rural areas, the priorities for resilience and sustainability will also be different. Due to climate change, the economy under various conditions of development and cultural changes, urban areas or urbanized villages must face issues such as sustainability maintenance and resilience adjustment will be much more sensitive and with higher uncertainties. In fact, there are similarities and differences between sustainability and resilience, therefore, the response methods adopted to deal with issues such as the natural environment and social organizations will also vary depending on factors such as urgency and time competition, sometimes the two are positively correlated, sometimes they are negatively correlated, and sometimes they may be morphologically unrelated, therefore, some innovations will be necessary to be considered, and which will also be discussed in this article. Two applications are presented for the sustainability and resilience on urban area are expressed to show the applicability and the relationships between sustainability and resilience. The twins, sustainability and resilience, may initially proceed in opposite directions (negative correlation) on the timeline of plan execution.
Two applications on "The Catchment Management with Flood Control Infrastructure" and "The COVID-19 on the Management of Sustainability and Resilience in Taiwan" are presented for the sustainability and resilience on urban area are expressed to show the applicability and the

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relationships between sustainability and resilience.
During the execution process, there will be a period when the two pairs develop independently, but in the end, they will proceed in the same direction (positive correlation). This is something worthy of our attention.

Keywords: Resilience, sustainability; urban; Rural; COVID-19.

1. INTRODUCTION

Change is inherent to the human context. Whether the need is catalyzed by extreme events such as floods, droughts and economic collapse or more gradual processes of change in environmental, technological or economic systems, we survive via adaptation. Strengthening the adaptive capacity of populations at all levels from the local to the global is, as a result, among the most important challenges facing development. While sustainability looks at how current generations can meet their needs without compromising that ability for future generations, resilience considers a system's ability to prepare for threats, to absorb impacts, and to recover and adapt after disruptive events. By discussing the sustainability and resilience indicators, we list as follows:(1) Sustainability is the ability to be maintained at a certain rate or level and avoidance of the depletion of natural resources in order to maintain an ecological balance, is a social goal for people to co-exist on Earth over a long time meanwhile focus on "What do we want to protect and conserve, and to keep from changing? (2) Resilience is the ability of a system to prepare for threat, absorb impacts, recover and adapt following persistent stress or a disruptive event or the capacity to recover quickly from difficulties and toughness and focus on "What do we want to adapt and change into something new, and maybe better? Both concepts are defined and used in many different ways to achieve a variety of political goals; both concepts share similar goals such as a focus on climate while a development strategy is not sustainable if it is not resilient.; and the two concepts are intertwined and cannot be successful individually as they are dependent on one another. Resilience focuses on the design for unpredictable, while sustainability focuses on the climate responsive designs. Adaptation is not only dependent solely on the presence of markets and other systems that enable flows to occur. The social capital and institutional checks and balances present in rural areas are equally central to adaptive capacity. Chloé Duffaut et al. [1] presented "Nature-based solutions (NBS) and emphasized in any case, it would be good to diversify any NBS to have a better chance of survival in the face of global changes". Viacheslav Iegupov, et al. [2] showed "the analyses on the modern theory and practice of making urban planning decisions, especially when placing responsible industrial, energy, and transport facilities; discussion of the need to consider the resource stability of natural systems, the peculiarities of the production of design and research works in conditions of increased geo-risks in connection with urbanization and global climate changes". A critical analysis of the existing practice of making the most important decisions regarding the development of territories, placement, and construction of transport facilities was performed.

2. THEORETICAL CONSIDERATION

2.1 What the Concerns with the Similarities and Differences between Sustainability and Resilience

Experts often describe sustainability as having three dimensions (Fig. 1): environmental, economic, and social, and many publications emphasize the environmental dimension. From the view point of the similarities between resilience and sustainability and will be: (1) Keeping consistence between human society and the natural environment is possible; (2) Focusing on the topics of social & ecological systems; climate change impacts; globalization and community or livelihood development is the common targets; (3) Pursuing system survivability, security & well-being is the goals. While the ideal segments between resilience and sustainability can be done from their purposes. The adoption indicators between sustainability and resilience are based on the means to achieve the goals (see Table 1 and Fig. 2 and 3).

2.2 Segments of Differences in Disaster Resilience and Differences of Practices between Rural and Urban

2.2.1 Urban

A settlement where the population is very high and has the features of a built environment;

including cities and towns with Fast and complicated life; greater isolation environment from nature; associated without agricultural work, i.e. trade, commerce or provision of services; densely populated; planned settlement exists in urban areas, that are developed according to the process of urbanization and industrialization; highly intensive social mobility; and always present at the time of job allotment.

2.2.2 Rural

an area located in the outskirts; including villages and hamlet with simple and relaxed life; environment directly contacting with nature; associated with agriculture and livestock; sparsely populated; Developed randomly, based on availability of natural vegetation and fauna in the area; less intensive social mobility; and no such division of labor.

'Two examples show the differences on strategies taken between urban and rural.

2.3 Differences in Disaster Resilience

"Resilience in urban areas is primarily driven by economic capital that community capital is the most important driver of disaster resilience in rural areas. Within rural areas there is considerable spatial variability in the components of disaster resilience. Rural areas often struggle to maintain government and business operations in normal times and do not have the excess capacity and resources needed during and after a disaster. The lack of human and financial resources can reduce resilience in rural places a problem often not encountered in urban places" [4]. Social inequalities might be magnified in both rural and urban areas, leading to less disaster resilience, but meanwhile economic diversification in metropolitan areas helps to promote disaster resilience compared to the single-sector economic dependence often seen in rural areas.

"The role of disaster resilience in the attenuation of vulnerability and the enhancement of risk reduction is not well understood, especially in the rural context, as noted earlier" [5]. There is little empirically based research on community- level natural hazard.

"Resilience indicators—composite measures that would permit an examination or comparison among places as to their present levels of resilience" [6,7,8]. Understanding and applying empirically based measures of what makes rural

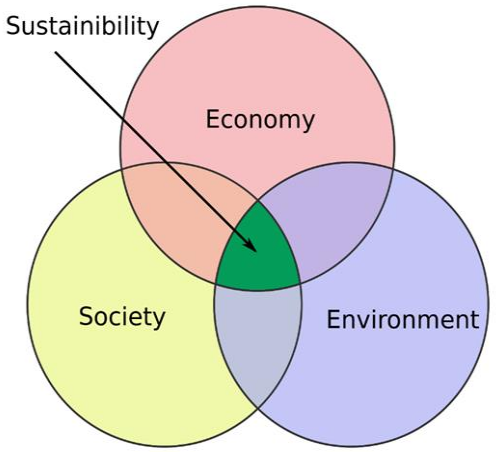

Fig. 1. Three dimensions of sustainability

Table 1. Adoption indicators of sustainability and resilience

Category	Sustainability Indicators	Resilience Indicators
Local Government Budgeting	*Conserving* environmental Resources – with protection & restoration	*Building* Capacity for Change on Level of infrastructure construction & resource access with Innovation for marketing
Environmental Knowledge	*Maintaining Traditional Resource* of local environmental knowledge and traditional practices	*Creating New Environmental Knowledge* of Participation in environmental education programs to Innovating the traditional knowledge
Community Well Being	*Preserving* Cultural & Traditions by based on natural resource to strengthen the traditional livelihoods.	*Improving* Living Conditions & Employment to Rate of unemployment & youth outmigration
Social Support Systems	*Providing* Social Welfare & Equity to Support elderly & underprivileged populations	*Supporting* Social Collaboration to rate of participation in religious & other local organizations

Source: Source: Alan Lew & Tsung-Chiung Emily Wu [3] with some modifications from author

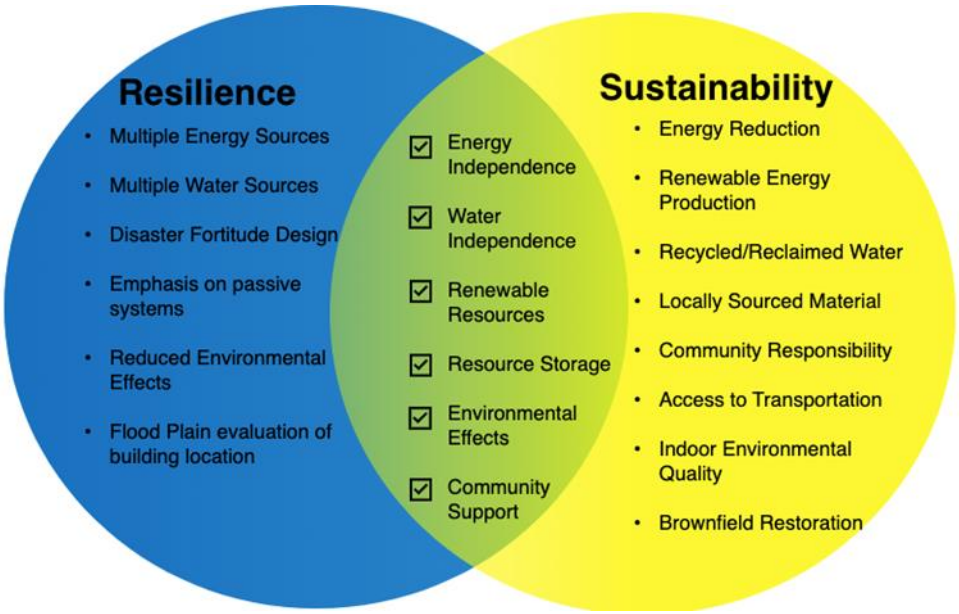

Fig. 2. Resilience versus Sustainability and the United Nations goals. Adapted from Echotape [9]

communities more or less resilient than urban ones illustrate the landscape difference across the nation.

The most important drivers for disaster resilience in urban areas were individual institutional variables—flood insurance coverage and jurisdictional coordination, followed by non-dependence on extractive industries or tourism (a surrogate for a diversified economic base) and employment rate. In the case of rural resilience, the most significant driver was an environmental variable—average percentage perviousness, again not a surprise. Whereas community capital was an important aggregate driver of rural resilience, individual infrastructure variables were more dominant in the disaggregated model, specifically number of major roads, hotels and motels, and hospital beds.

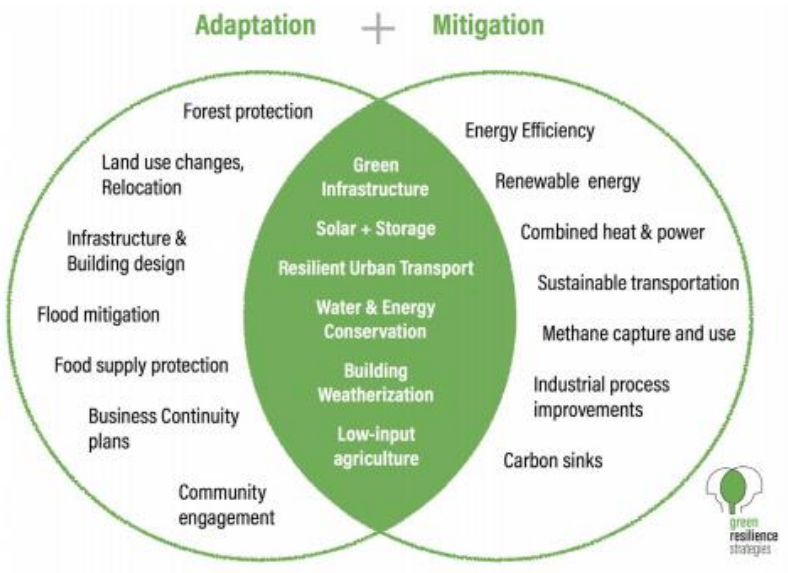

Fig. 3. Climate Adaptation and Mitigation Synergies. Green Resilience Strategies [10]. Graphic concept modified with acknowledgement of David Macleod, City of Toronto

2.4 Differences of Practices in the Response to the COVID-19 Pandemic

“The COVID-19 pandemic is the largest disastrous health crisis ever experienced in recent centuries, as it has confronted health systems with extraordinary challenges, often placing extreme pressure on the health workforce and requiring rapid changes in their deployment, with rural and deprived areas worst-served” [11]. “Rural populations already experience worse health status than urban populations.

This is partly due to a higher incidence of chronic conditions, higher age and vulnerability, higher child and maternal health problems and engagement in health risk behaviors” [12]. Ferdinando Petrazzuoli, et al. [13] presented “the differences between rural and urban practices in the response to the COVID-19 pandemic, emphasizing aspects such as management of patient flow, infection prevention and control, information processing, communication and collaboration. The existence of certain issues that could impact patient safety in rural areas more than in urban areas due to the underlying differences in population profile and supports”.

3. THEORIES AND APPLICATION

3.1 Theories

3.1.1 Urbanization

Urbanization is the population shift from rural to urban areas, the corresponding decrease in the proportion of people living in rural areas, and the ways in which societies adapt to this change. Urbanization can be seen as a specific condition at a set time, or as an increase in that condition over time. Urbanization is not merely a modern phenomenon, but a rapid and historic transformation of human social roots on a global scale, whereby predominantly rural culture is being rapidly replaced by predominantly urban culture.

3.1.2 Overurbanization

Overurbanization is intentionally comparative and has been used to differentiate between developed and developing countries. Several causes have been suggested, but the most common is rural-push and urban-pull factors in addition to population growth. Overurbanization by two factors: that migration to cities led to a "less than optimal allocation of labor between the rural and urban sectors" and that migration to cities "increases the costs of providing for a country's growing population. Developing and applying an urban resilience and sustainability indexes for the evaluation of declining area, or said overurbanization, will also be needed [14].

3.1.3 Urbanization and resilience

Urbanization and resilience are two concepts that are closely related. Urbanization refers to the process of people moving from rural areas to urban areas, and the growth of cities and towns. Resilience, on the other hand, is the ability of a system to withstand and recover from shocks and stresses. In the context of urbanization, resilience refers to the ability of cities and towns to adapt to change, recover from disasters, and maintain their functions in the face of challenges. Urbanization is an emerging humanitarian disaster that can have significant impacts on the resilience of urban systems. There are several factors that contribute to urban resilience, including infrastructure, social networks, governance, and economic systems. Improving urban resilience requires a multi-disciplinary approach that involves collaboration between different sectors and stakeholders [15].

3.2 Application

Two applications are presented as following.

3.2.1 The catchment management with flood control infrastructure

Comparative study of catchment changes and geological characteristics of area have presented an interesting correlation of water recharge, urbanization and geological responses. Urbanization caused a noticeable increase in runoff. Likewise, an analysis of the development data showed that urbanization in the watershed consisted more of connecting already developed areas than of creating new ones, which increased the watershed’s conveyance capacity and explains in part the change in its response, therefore the detail data collection, such as rainfall, runoff, damage causes on public Infrastructure, with the suitable tools for analyzing the coming results, in order to give adequate strategies become particularly important. Sustainable development seeks to utilize the landscape within its capacity to renew, while recognizing that humans are part of the system and that some use should be permitted.

Land use planning, in particular balances environmental conservation with demands for economic stability. Changes in land use planning in urban planning have caused changes in surface conditions, especially the worsening of impermeability, which directly accelerates the speed of floods and also reduces the soil's ability to infiltrate and retain water. In general, even if the amount of floods is increased, it will also intensify the threat to people's lives and property. Increased carbon emissions have warmed the earth and caused climate change. Short-term heavy rainfall and hydrological events have caused existing flood control plans to gradually lose their function. We examine the watershed management and find the main factors on hazards, exposure, and vulnerability, combining them called risk. (See Fig. 4).

Getting the information for the judgement of the flood control constructions or the Infrastructure in what degrees of conditions will be important work. The information are guiding as following scheme in Fig. 6,

We can collect the relating information in detail as the listed:

3.2.1.1 The processes and application on sustainability

A. Environmental factors influenced on the structures (Fig.5):

a) River channel characteristics: beach width; flow path meandering degree, and Degree of river erosion and siltation.
b) Hydrological characteristics: flood level.
c) Flood control structures characteristics: type and age of use.
d) Watershed characteristics: fault distribution.
e) River usage behavior: river planting, sand and gravel mining, and cross-river structure.

B. Vulnerability factors influenced on social assistance:

a) Social economy: population, proportion of vulnerable population, and public utilities.
b) Disaster prevention and resilience: evacuation sites and evacuation routes,Medical supplies and relief supplies.

Visual inspection, ground-penetrating radar, infrared penetration, percussion echo, rebound hammer and core sampling are used to conduct compression tests to determine the safety and suitability of existing structures for flood control functions, and divided them into five Levels, namely "immediate improvement", "note improvement", "plan improvement", "continuous tracking", and "safety" as the action guideline for the sustainability. Generally speaking, "immediate improvement" refers to tasks that must be dealt with immediately to prevent the occurrence of disasters immediately. Others require necessary measures to be taken in sequence or funds allocated to implement disaster reduction work in stages.

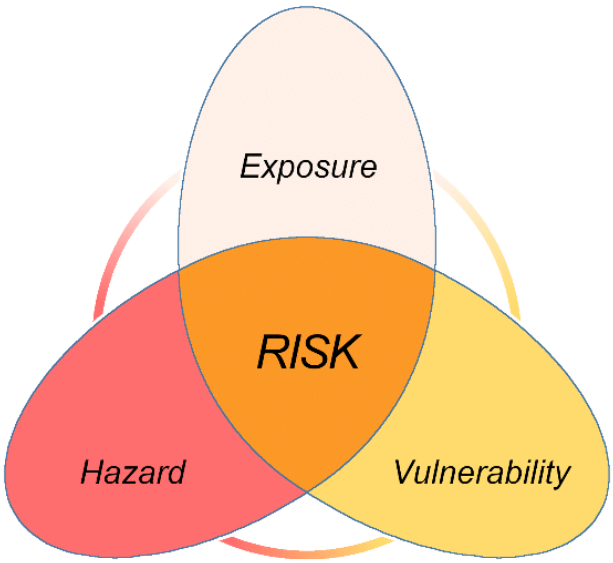

Fig. 4. Diagram of Risk: Hazard ∩ Exposure ∩ Vulnerability

3.2.1.2 The processes and application on resilience

From the viewpoint of resilience (Fig. 5 and 6), disaster risk is expressed as the likelihood of loss of life, injury or destruction and damage from a disaster in a given period of time. They own the following relationship:

[Disaster Risk]=[Hazards (Mainly Natural Causes)] × [Vulnerability (Mainly Social) Causes)] × [Exposure (Previous Actions)] (1)

and meanwhile we have that

Resilience= [I] – Risk = Adaption; [I] is the unit matrix. (2)

A hazard is a process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation. Hazards may be natural, anthropogenic or socio-natural in origin. Hazards are often categorized by whether they are natural (sometimes termed physical) or technological (sometimes called man-made or human-induced). Most disasters that could happen have not yet happened. The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas, and we call it “Exposure”. If a hazard occurs in an area of no exposure, then there is no risk. Vulnerability accounts for the susceptibility to damage of the assets exposed to the forces generated by the hazard. fragility and vulnerability functions estimate the damage ratio and consequent loss respectively, and/or the social cost generated by a hazard, according to a specified exposure.

General risk management methods can be divided into risk avoidance (avoid), risk mitigation (mitigation) and risk transfer (transfer). Finally, the unavoidable part is the disaster risk that the enterprise itself needs to bear, that is, the degree of risk retention.

Reducing the disaster retention part through disaster assessment and management is the specific action for disaster reduction. Risk avoidance means completely avoiding risks and cut off sources of risks, such as removing vulnerable factors and relocating settlements within the area affected by landslides. Risk mitigation is taking countermeasures to reduce the probability of disaster and reduce losses for controllable risks, including engineering, non-engineering and management. Risk transfer characterize as transferring all or part of the risks to others or other places to reduce risk losses. Those are so called adaption for resilience [16].

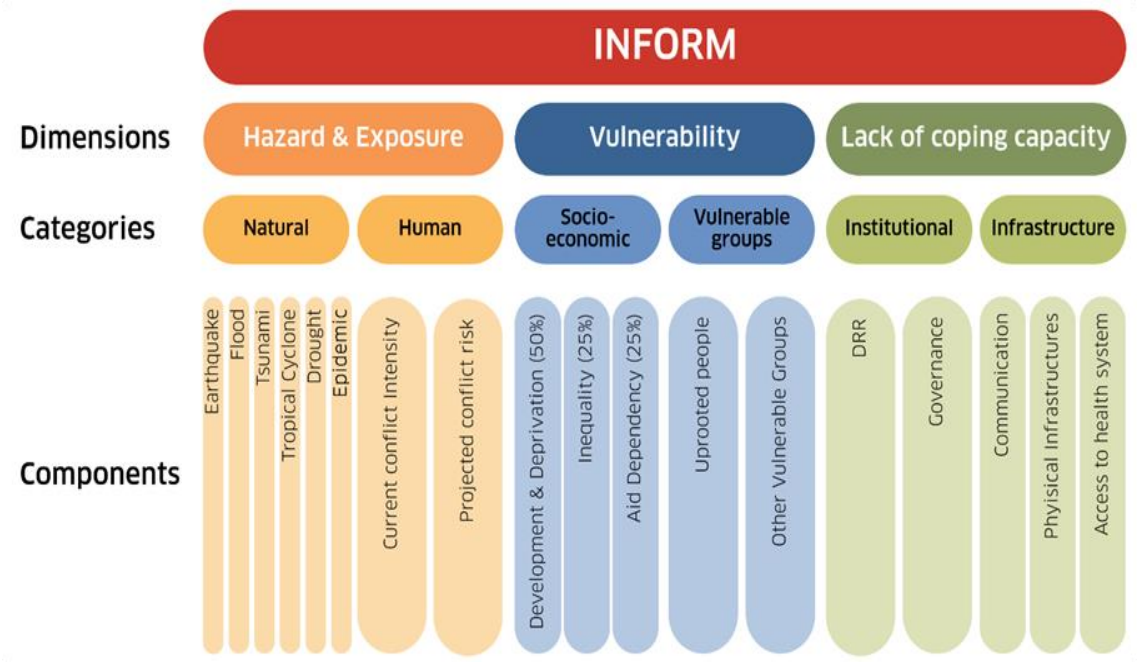

Fig. 5. Diagram of The Catchment Management with Flood Control Infrastructure

The resilience adaption could be concentrating on strategies, meanwhile sustainability might be on functional restoration to achieve immediate disaster reduction or avoidance. Resilience may treat as a long-term target, and sustainability as the short-term means. The twins, sustainability and resilience, may initially proceed in opposite directions (negative correlation) on the timeline of plan execution. During the execution process, there will be a period when the two pairs develop independently, but in the end, they will proceed in the same direction (positive correlation). This is something worthy of our attention (Fig. 6).

3.2.2 The COVID-19 on the management of sustainability and resilience in Taiwan

The COVID-19 crisis emerged with such unprecedented breadth and impact that governments have been compelled to transform – away from their traditional roles as regulators (and managing the societal impacts of a health emergency), and towards the role of active players in the medical supply chain. The COVID-19 crisis has transformed the role of some stakeholders in the medical supply chain. Governments and large global NGOs – once focused largely on regulatory matters and alleviating the social consequences of crises – are now moving towards a more active role in the supply chain to finance, secure and provide medical supplies, including PPE, tests, therapeutics and vaccines. A better understanding of recent disruptions in the medical products supply chain can help governments as well as pharmaceutical and medical equipment companies better prepare for future emergencies. Forming partnerships with logistics service providers who can complement existing network-related capabilities will be a strategic necessity in securing life-saving products and supplies during the inevitable next crisis. Since the outbreak of COVID-19 at the end of December 2019, 1.7 million people have been infected and 100,000 people have died worldwide. Taiwan established a Central Epidemic Command Center on January 20, and the first case appeared on January 21. This new coronavirus has invaded Taiwan for 83 days. So far (April 11), 385 cases have been confirmed and 6 people have unfortunately died. Not only Taiwan, but also the global epidemic has quickly entered a period of major outbreak. There are some important actions the Taiwan government has done:

A. The threat of community infection increases, and epidemic prevention policies are reversed.
   1. Wear a mask when taking public transportation.
   2. Masks cannot be reused by steaming them in an electric pot.
B. The virus has changed greatly, and new clinical indicators have been added. Most of the patients abroad are elderly and more male than female. However, in Taiwan, most of the patients are young and more female than male. The reason is that many cases are immigrants from abroad, mostly international students. "The epidemiology in Taiwan is different from that abroad. These data It will let us know that it is not the old people we should pay attention to, but the young people who want to go abroad." The cases in Taiwan have also changed from the initial cases of imported cases mainly from China, Hong Kong and Macao, to the recent changes mainly from overseas students and tourist groups returning to Taiwan from Europe and the United States. The confirmed symptoms and clinical manifestations are different.
C. Quarantine measures are revised on a rolling basis according to the epidemic situation. In response to changes in the epidemic, the policies of the Central Epidemic Command Center have been constantly updated, and some have even reversed early epidemic prevention measures. For example, can masks be steamed in an electric pot and reused? In addition to cough and runny nose, what other symptoms should I pay attention to? "The Reporter" compiled a total of 6 command center policy changes and explanations in 3 categories, and analyzed them one by one by experts and scholars to clarify the considerations and concerns before and after the policy changes.
D. After the home quarantine period expires, independent health management will be extended.
E. Gradually expand the scope of screening and select the time to return to Taiwan.
   1. Four major categories of priority testing targets include medical and nursing staff, airline crews, high-risk subjects such as the U.S. backtracking project, and those who visited crowded scenic spots during the Qingming Festival holiday.
   2. People with cold symptoms in the community.

3. High-risk groups, such as densely populated institutions, long-term care institutions, patients with chronic diseases, medical staff, caregivers, etc.

3.3 All the above Actions have Sufficient effects for the Controls of COVID-19 on Sustainability

In the early days of the COVID-19 pandemic in 2020, Taiwan was able to control the epidemic without relying on strict and tough control measures such as closing the city and suspending classes and classes, becoming an international "model student in epidemic prevention." However, the continued implementation of intervention measures such as border control, isolation and quarantine, and social distancing will impose huge economic and social burdens. At the same time, Taiwan's vaccination plan started later than other countries, and it has not yet reached herd immunity. If we want to do a good job in long-term and to prepare for the war against the virus, it is necessary to understand the scale of results that each epidemic prevention strategy can bring, and to make the best arrangements for possible changes in the epidemic in the future.

The unremitting efforts of relevant government units in contact tracing and management of confirmed cases, as well as the people's patient cooperation with epidemic prevention measures such as masks and social distancing, contributed to Taiwan's success in the early stages of the COVID-19 epidemic. This research result also supports the importance of nationwide epidemic prevention. In the future, even if vaccine coverage gradually increases, whether public health departments and the public can continue to work together to fight the epidemic in the face of unpredictable new coronavirus variants will be the key to national health.

3.4 For the resilience on COVID-19 prevention, the necessary strategies are:

A. Strictly enforce border quarantine to prevent the epidemic from spreading overseas.
B. Depending on the international epidemic situation, entry regulations will be adjusted on a rolling basis
C. The epidemic being under control and continues to ease, and various measures will continue to be relaxed.
D. Scientifically managed isolation and quarantine measures objects.
E. Established a care center for central and local governments.
F. Added various important community prevention and control measures.
G. Expand the admission and treatment capacity of centralized quarantine sites.
H. COVID-19 vaccine acquisition and vaccination.
I. Paying attention to the occurrence of new viruses and continue to develop new vaccines.
J. Strengthening the procurement of therapeutic drugs.
K. Strengthening community monitoring.
L. Deepening epidemic prevention cooperation with the European Union, the United States, Australia and other countries.
M. Promoting participation in WHO.

For the COVID-19 management, we can find that the sustainability, a functional-immediate work, is a part of resilience, the long-term strategy

4. DISCUSSION

4.1 Urbanization and Sustainability

The interplay between urbanization and environmental sustainability is intricate. This duality necessitates a thorough review to delineate the nuances and provide a balanced understanding (Fig. 7). The profound implications of urbanization on environmental sustainability present an intricate tapestry of challenges and opportunities.

4.2 Urbanization and Resilience

The concept of resilience is used in multiple scientific contexts, being understood according to several different perspectives. Recently, resilience is triggering increasing interest in engineering contexts, referring to communities and urban networked systems, as the capability to recover from natural disasters. The definition of resilience is highly variable depending on the subject area, which it is applied to. Essentially, most of studies focus on the resilience quantification aimed at planning for mitigation, adaptation and recovery of a physical urban system. Nonetheless, diverse applications of the resilience concept can be used (Fig. 8). resilience is assessed according to two main

approaches: qualitative and quantitative. Analogously, monitoring progress of the recovery process is also fundamental to the resilience assessment.

4.3 Urbanization with Resilience and Sustainability

Environmental conservation and sustainability concerns in general and the complex challenges of urban development and sustainability, respectively, are sensitive on the need to live within resource constraints and in harmony with ecological principles. As with its counterpart term, "sustainability," the application of the term "resilience" to socioecological systems gained prominence in relation to discussions of broader issues of conservation; both have been relatively recently applied to urban systems. Resilience has found favor among widely divergent groups of actors, in large part because of the fuzziness to the stage that world political and religious leaders across the spectrum profess at least rhetorical commitment to the objective at summits and in policy statements, even if their actions are less than fully and malleability of the term that enables it to act as a "boundary object", representing the different things to different sets of players. Planning for resilience in an era of change requires the effective incorporation of typical characteristics of twenty-first century urban centers, including challenges of social, ecological, and economic diversity; balancing modularity with tele-connected networks; and redundancy with efficiency (Fig. 9).

4.4 Innovation

The concept of innovation is complex and can generate changes at various levels and unpredictable effects. It is a complex concept that must be analyzed according to the type of social issue, the extent of desired change, stakeholders and ethical concerns. innovation can be radical or incremental. Incremental innovation is built from existing concepts and increases organizations' overall performance by extending and improving existing value offerings. Radical innovation represents revolutionary changes favored by the circulation of knowledge. Radical innovation happens through the creative destruction triggered by entrepreneurship, and it is about the destruction or discontinuity of the old paradigm to create a different market. Occasionally, radical innovation is an opportunity niche, not noticeable or exciting for large organizations to explore. Incumbent firms can also be inhibited by the potential of this innovation to cannibalize a profitable business. Those characteristics are like opportunity entrepreneurship, which has higher success rates and is less vulnerable to external factors. Ecological conservation, energy conservation and carbon reduction are important sustainable goals of green urbanism and the direction of Litchi's innovative pursuit of restoration. (Fig. 10)

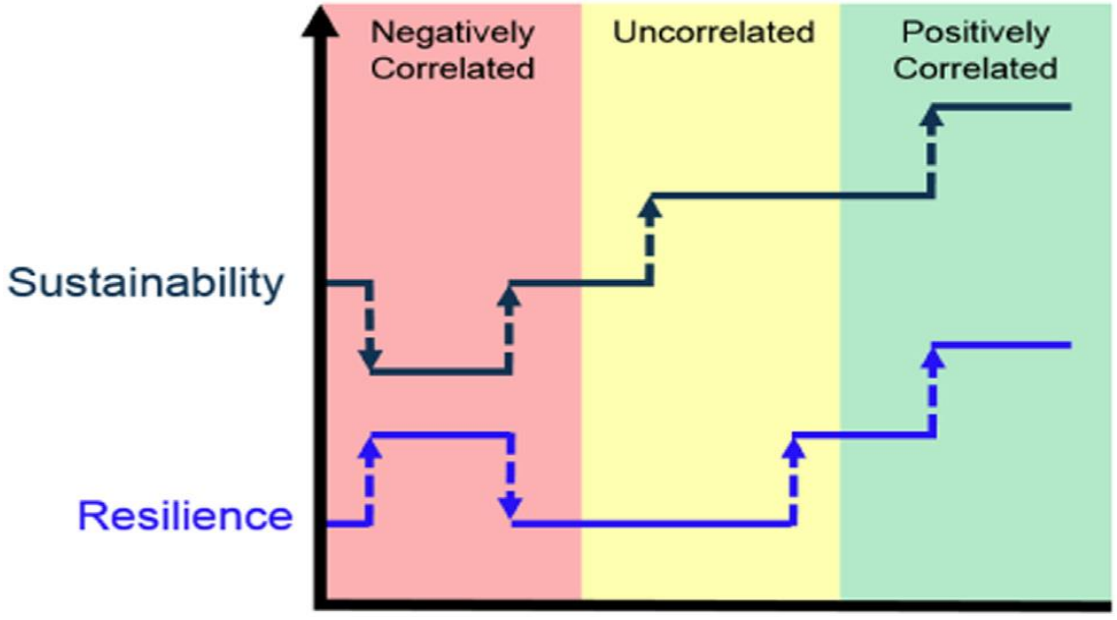

Fig. 6. Variation of sustainability-resilience in processes

Fig. 7. The profound implications of urbanization on environmental sustainability

Fig. 8. Diverse applications of the resilience concept

Fig. 9. Urbanization of the interaction between sustainability and resilience

Fig. 10. Example of innovation on green urbanism of urbanization

5. CONCLUSIONS

Sustainability is often operationalized as the triple bottom line—using environmental, economic, and social indicators to measure performance. The important contributions of resilience are its specific views on dealing with risks and uncertainties. Hence, in an uncertain and complex environment, sustainable innovation that aims at realizing sustainability through constantly meeting the environmental, economic, and social requirements needs to be supplemented with new methods for resilience management. A key innovative capability underpinning sustainable innovation is therefore the capacity to handle risks and uncertainties in order to prevent, endure, and recover from disruptions. Stability is an organization's ability to withstand stress and to thus avoid a loss of function in the face of environmental turbulence. This term originates from engineering management references, and engineering resilience is defined as a system handling large stresses and returning to normal quickly after these stresses. In this article, two applications on "The Catchment Management with Flood Control Infrastructure" and "The COVID-19 on the Management of Sustainability and Resilience in Taiwan" are presented for the sustainability and resilience on urban area are expressed to show the applicability and the relationships between sustainability and resilience. These two examples will be the problems faced by all countries in the world, whether advanced or developing countries. I hope that these cases can serve as a starting point.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Chloé Duffaut, Pierre-Antoine Versini, Nathalie Frascaria-Lacoste. Are really Nature-Based Solutions sustainable solutions to design future cities in a context of global change? Discussion about the vulnerability of these new solutions and their probable unsustainable implementation Science of The Total Environment. Elsevier. 2022;853:158535.
2. Viacheslav Iegupov, Gennadii Strizhelchik, Rajeshwar Goodary. Sustainable development of the engineering geological environment of urban areas: Transition from Theory to Practical Solutions, Proceedings of the 8th World Congress on Civil, Structural, and Environmental Engineering (CSEE'23) Lisbon, Portugal. 2023:151.
   DOI: 10.11159/icgre23.151
3. Alan Lew, Tsung-Chiung Emily Wu. Community sustainability and resilience: Similarities, Differences and Indicators. Tourism Geographies; 2016.
   Available:https://www.researchgate.net/publication/287805372
4. Tootle DM. Disaster recovery in rural communities: A case study of southwest Louisiana". Southern Rural Sociology. 2007;22(2): 6–2
5. Tobin G, Whiteford LM. Community resilience and volcano hazard: The eruption of Tungurahua and evacuation of the faldas in Ecuador. Disasters. 2002; 26(1):28–48.
6. Barnett J, Lambert S, Fry I. The hazards of indicators: Insights from the Environmental Vulnerability Index. Annals of the Association of American Geographers. 2008;98(1):102–19.
7. Burton CG. A validation of metrics for community resilience to natural hazards and disasters using the recovery from Hurricane Katrina as a case study. Annals of the Association of American Geographers. 2015;105(1):67–86.
8. Cutter SL. The landscape of disaster resilience indicators in the Uited States. Natural Hazards 2015;80(2):741–58.
9. Echotape. Why building resilience is the future of sustainable building; 2018.
   Available:https://www.echotape.com/blog/why-building-resilience-is-the-future-of-sustainable- building/
   Retrieved February 17, 2021.
10. Climate Adaptation and mitigation synergies. green resilience strategies. Building adaptation in CONSTRUCTION - Objectives, Importance; 2017.
    Available:https://theconstructor.org/building/building-adaptationconstruction/17792/#:~:text=Adaptation%20means%20the%20ability%20to,the%20performance%20of%20the%20building (Retrieved February 17, 2021)
11. Sagan A, Webb E, Azzopardi-Muscat N, de la Mata I, McKee M, Figueras J. Health systems resilience during COVID-19". In Lessons for Building Back Better; World Health Organization: Geneva, Switzerland; European Commision: Brussels, Belgium;

European Observatory on Health Systems and Policies: Brussels, Belgium; 2021.

12. Ziller EC, Lenardson JD, Ahrens M, Katherine. A. Rural-Urban Residence and mortality among three cohorts of US adults; University of Southern Maine, Maine Rural Health Research Center: Portland, OR, USA; 2020.
13. Ferdinando Petrazzuoli, Claire Collins, Esther Van Poel, Athina Tatsioni, Sven Streit, Gazmend Bojaj, Radost Asenova, Kathryn Hoffmann, Jonila Gabrani, Zalika Klemenc-Ketis, Andrée Rochfort, Limor Adler, Adam Windak, Katarzyna Nessler and Sara Willems.. Differences between Rural and Urban Practices in the Response to the COVID-19 Pandemic: Outcomes from the PRICOV-19 Study in 38 Countries". International Journal of Environmental Research and Public Health; 2023.
14. Cutter SL. The landscape of disaster resilience indicators in the United States". Natural Hazards. 2015;80(2):741–58.
15. Susan L. Cutter Kevin, Ash D, Christopher, Emrich T. Urban–Rural Differences in Disaster Resilience, Annals of the American Association of Geographers; 2016.
ISSN:2469-4452 (Print) 2469-4460 (Online)
Journal homepage
Available:https://www.tandfonline.com/loi/raag21
16. Wagner F. Risk mitigation in green building; 2009.
Available:https://www.constructionbusinessowner.com/green/risk-mitigation-green-building. Retrieved February 17, 2021.

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