PLANNING MALAYSIA:
Journal of the Malaysian Institute of Planners
VOLUME 19 ISSUE 2 (2021), Page 14 – 26

FORMULATION OF A MALAYSIA MODERN RURAL DEVELOPMENT FRAMEWORK: SYNERGISING RURAL FOR CHANGE

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Abstract

Malaysian government aims to transform rural areas into economic focal points, improves rural livelihoods, living environment and narrows the life quality gaps between those living in urban and rural areas. Inspired by the government directive-aspirations and the emergence of new technologies in national and global rural practices, this paper attempts to discuss the formulation of a framework for rural development in Malaysia based on a modern approach. The process undertakes two main stages, namely focused literature study and review of the national existing policies and strategies to identify the key assessment elements and criteria for modern rural development. The next stage was to conduct an expert view survey to validate the developed elements and criteria, and then formulate a Malaysia modern rural development framework (FMRD). The FMRD was finally formulated by incorporating the elements and criteria promoted in the national policies and strategies and integrating them with smart technologies and ICT practices to reflect a holistic approach for rural issues. This paper concludes that the FMRD is a timely approach for the rural assessment measure to maximise its performance towards the future niches in Malaysia - rural liveability-resilient-and-smart.

Keywords: Modern rural, liveable-resilient-and-smart, rural infrastructure, Internet of Things, Industrial Revolution 4.0

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INTRODUCTION

In Malaysia, there were more than 26,400 villages in 2017 that contributed to as much as 26% or 7.8 million of the nation's total population (Dasar Perancangan Fizikal (DPF) Desa Negara, 2017). Moreover, the rural population size is expected to slowly decrease by years and will reach approximately 7 million in the year 2030. These circumstances are mainly due to the increase of out-migration especially youths from rural to urban areas as a result of limited economic boosters, lack of investments and technology practices, that consequently, contribute to low productivity, older human resources, low wage, etc. (see Hassan & Mustafa, 2012; Rashid, 2019). Omar et al. (2018) also highlighted the importance of youth facilities which were akin to urban standards to ensure youth would be engaged in community programmes and rural human resource.

In responding to the alarming situations, various national development policies and strategies were introduced to reduce the urban and rural development gaps as well as to improve the social well-being of the rural community. As the national development plans are accordingly aligned with the impact of the internet of things (IoT) and Industry Revolution (IR) 4.0, the existing rural development strategies should be realigned to meet the new economic movements (Malaysian Institute of Microelectronic System-MIMOS, 2015). Currently, as a continuation to this initiative, the most important ongoing policies are DPF Desa Negara 2030 (launched in 2017), which is Malaysia's first form of rural-national spatial development policy, Dasar Pembangunan Luar Bandar (DPLB) 2030 (in 2018) and the most recent is the Wawasan Kemakmuran Bersama (WKB) 2030. These are the most important development tools to synergise rural change and social well-being which are aligned with the Sustainable Development Goals (SDGs, 2015) within Malaysian national agendas. To this extent, rural assets and resources (agricultural, entrepreneurship, business, tourism) should be further explored to prevent any obstacles or difficulties faced by rural communities in fulfilling their needs in the global urbanisation challenges.

Inspired by this, the current research aims to formulate a framework for modern rural development in Malaysia based on a new approach – focusing on rural infrastructure planning and technology practices. That is part of an approach to empower rural actors by providing them solutions through a measure – a missing link approach for synergising rural change and community social well-being towards a modern concept.

MODERN RURAL APPROACH: LIVEABLE, RESILIENT AND SMART

The concept of modern rural development is mainly concerned with the development intention in the early industrial revolution era (Levin & Feniger, 2018). It aims to transform the village into a modernised area while impacting the rural economy, social, environment and technology, and bringing enhancement to rural communities' livelihoods. Hence, the term modernisation can be broadened to reflect the varied ways in which it has been practised and the way these variations resulted in diverse visions of modernisation. In the emergence of the digital era with the Internet of Things (IoT) (see Morgan, 2014) and other enhancements such as drone technology practices, Geographic Information System (GIS), etc., the Malaysian government seizes these opportunities and is playing a vital role in improving rurality development as well as its support systems towards the establishment of a modern rural area. Many Asian countries such as India, Indonesia and Malaysia, as well as European countries have embarked on the task using this approach, particularly in smart village initiatives (see ENRD, 2018; Smart Village, 2017; Rahmawati et al., 2017, Razak et al., 2013). As suggested in the literature, development criteria of a modern rural village should include such as strengthening local business, education, health and welfare, technology engagement, and food security: all of which are compulsory elements in the modern rural approach (Levin & Feniger, 2018; Rahmawati et al., 2017).

As such, this research would formulate a modern framework of rural development in a new way, based on the existing Malaysia National Policies framework, specifically the DPF Desa Negara 2030 – which focuses on liveable and resilient rural and the DPLB 2030 – to attain sustainable rural living, and efforts are embedded with the best practices of smart village models, internationally. To the best of our knowledge, only a few researchers have explored this area in Malaysia.

DPF Desa Negara 2030

The DPF Desa Negara 2030 was formulated as an essential blueprint to drive development actions towards rural communities' prosperity with the vision of **"**Prosperous Rural, Prosperous Nation". This vision puts rural areas as the most significant element of decision-making in urban and regional planning in Malaysia. It is oriented towards its objective "liveable and resilient rural". In line with the concepts of Sustainable Development Goals (SDGs) and 11th Malaysia Plan 2016-2020, the DPF Desa Negara 2030 was constructed by taking into consideration the vital elements in developments, which are physical, economics, social and environment to overcome the alarming issues of development imbalance between the urban and rural areas, as well as urbanisation.

In relation to the focus of the study, which is to identify rural infrastructures, facilities or any other rural physical attributes for modern rural development, four main thrusts were evaluated; Thrust 2, Thrust 3, Thrust 4 and

Thrust 5. Thrust 1 is deemed unsuitable as it focuses on the sustainable plan and strategy management of the rural environment that has less emphasis on the physical or infrastructure elements. However, the provision of environment-related-infrastructure is covered under Thrust 3 (Reinforcing rural liveability). Thrust 2 focuses on the strategy in reinforcing urban-rural relationship to improve rural dwellers' quality of living and living environment (such as more progressive, comfortable, inclusive and assuring social welfare, liveability and prosperity) through complete infrastructures, facilities and services especially at town and rural growth centre. Thrust 3 is the strategy to reinforce the liveability of the rural community by focusing on the basic facilities within the village besides exploring and promoting rural assets such as agriculture, traditional houses, and the aesthetics of the rural environment that might be unavailable or scarce especially in the city. Thrust 4 puts focus on the strategy of empowering rural economy through the exploration of diverse rural sources and integrating best practices to improve productivity, marketing technique and maximum revenue. Finally, Thrust 5 puts the focus on implementable rural management, as an instrument to the implementation of a targeted and sustainable rural development plan: the major factor in the effectiveness of a rural development implementation lies in its implementation or execution stage.

As a result, there are eight criteria groups were formed to represent 101 criteria derived from Thrust 2 to Thrust 5 of the DPF Desa Negara 2030, namely the rural infrastructures, facilities and rural economy and services as well as distinctive rural governance that are required for synergising rural change and community social well-being to establish a future rural face of modernisation, welfare and prosperity. Those criteria went through a validation process based on an expert view survey and were finalised in Table 2.

DPLB 2030

DPLB puts an emphasis on the vision, "A Prosper, Inclusive, Sustainable and Holistic Rural" as the main agenda in the process of developing Malaysian rural by the year 2030. This vision highlights the assurance of access for infrastructure and social facilities which are equitable to those in the city to the rural community. Most importantly, rural areas are targeted to offer jobs and business opportunities that are capable of increasing the income of the rural population and attract those who have left to come back and reside in rural areas. This target is aligned with the DPF Desa Negara 2030. Bachok et al. (2019) also highlight the need for the empowerment of rural products such as agro-tourism and other tourism-based initiatives to generate more income for the people. More importantly, it is projected that the rural area is able to contribute to creating new jobs and business opportunities, domestic and international tourism choice, thus, the rural population's income and living standard will increase.

Smart Rural Concept

It is not an easy task to identify the appropriate criteria for smart technology practices complementary to rural development execution in Malaysia as mentioned. It is due to many obstacles relating to mindset, capability, skills, preparedness, etc. (Razak et al., 2013). Having said that, benchmarking and positioning to the current best practices of international experiences is most important. Therefore, this research has selected six relevant projects/studies to extract the key assessment criteria for modern rural development in Malaysia (see Somwanshi et al., 2016; Kaur, 2016; Smart Village, 2017; Kamal et al., 2016; Natarajan & Kumar, 2017; Ramachandra et al., 2015).

Literally, the smart villages are rural areas and their communities which were built on their existing strengths and assets with new enhanced practices by means of digital communications and technologies, innovations and better use of knowledge. In other words, they are about rural communities taking the initiative to find practical solutions – both to the severe challenges they face and, importantly, to exciting new opportunities which are transforming rural areas (ENRD, 2018; Smart Village, 2017). The basic 'smartness' components include access to high-quality education, health care, information and communication technology, finance, clean water and sanitation, and enhanced livelihoods, including villagers' own value-added entrepreneurial activities. It also generates new forms of cooperation and alliances between farmers and stakeholders, the government and private sectors; from the bottom-up and enhanced with the top-down inputs (ENRD, 2018). Hence, Industrial Revolution 4.0 – as the key indicator for technological enhancement, currently becomes a new trend or trademark in all things, particularly the global development paradigms (Lom et al., 2016); indeed, rural development should align with technology-driven progress, distinctiveness and completeness.

By working on the six materials, this research then identified five criteria groups, which consists of 35 criteria as a catalyst for synergising rural change in Malaysia towards a smart village; that collaborates all potential criteria seamlessly to maximise the rural potential that benefits rural areas and the community as a whole. From those criteria, there are some criteria of the technology practices which are very new in Malaysian rural context such as smart health facilities, Fisheries Information System (FIS), vertical farming, drone technology, and others: all these were finalised in Table 2.

METHODOLOGY

Designing a Modern Rural Development Framework and Assessment Criteria Identification

As the pathways of modern rural development are divergent, they are inclusive of an integration of criteria namely liveable, resilient and smart: Hence, the process was structured into three stages as indicated in Figure 1. This research is

intentionally designed to look at rural infrastructures and the best technology practices in today's worldwide rural development.

Stage 1 is the review of contemporary concepts in rural development which focuses on the international smart village practices. Only six relevant materials were reviewed to identify the key assessment elements and criteria (i.e. infrastructures and technology practices) for modern rural development. These articles are selected since they incorporated the practised smart villages in India (see Natarajan & Kumar, 2017; Somwanshi et al., 2016; Kaur, 2016; Ramachandra et al., 2015), Bangladesh (see Kamal et al., 2016) and some other countries in the world such as Tanzania, Nigeria and the United Kingdom as comprised in Smart Village (2017). Based on the content analysis method (see Krippendorff, 2004), the extracted and rephrased contents were organised into four columns which comprised of article/report info, definition, concept, and technology practices; and these were followed by the two syntheses columns (the key assessment elements and criteria) in a summarised form to (a) potential criteria groups, and (b) potential criteria.

For Stage 2, the researcher conducted a similar process, which involved reviewing the contents the DPF Desa Negara (thrust 2 to thrust 5), and then the contents were classified and tabulated into the criteria groups and the assessment criteria (refer to the proposed infrastructures, public amenities, economic activities, etc., that benefit to rural communities). Without exception, the key important inputs from the DPLB 2018 were also included in the framework to ensure the developed framework would be in line with the government's aspirations.

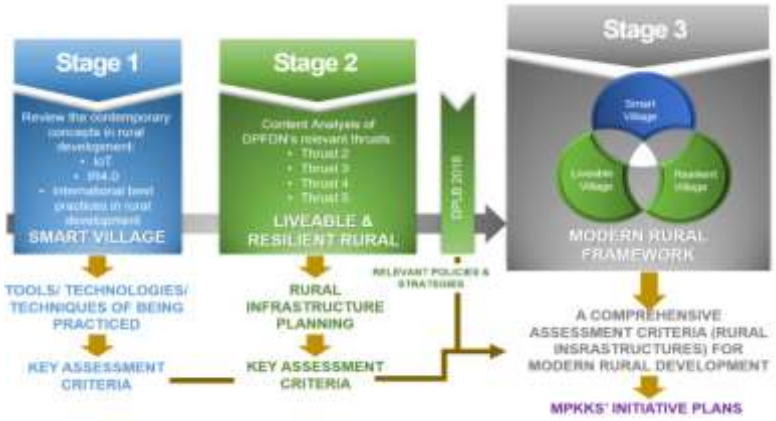

Figure 1: Conceptual process of designing a modern rural development framework.

The final stage is the formulation of the modern rural framework that is a combination of three dimensions: Resilient, Liveable & Smart with comprehensive assessment criteria that are centred to MPKK (*Majlis Pengurusan Komuniti*

Kampung) initiative plans thus would be useful and practical to undertake by rural actors. The key assessment elements were then structured into dimensions, criteria groups, and criteria.

Validation Process Through Expert Opinion Survey

The research applies a single-round expert view survey with a structured assessment form (rating priority exercise) to validate and assess the importance/relevance of dimension, group criteria and criteria considered in the study to reflect modern rural development outcomes. The designed assessment form also encouraged the experts to suggest additional criteria that they feel are relevant but not included in the list. They can also make recommendations to delete/combine/rephrase any dimensions, criteria groups, and criteria that they believe would improve the understanding and quality of the overall assessment for modern rural development.

Selection of experts was based on the involvement in the rural development projects and the formulation of rural development policies as well as participation in smart and green technology practices. The survey was administered by using docs.google.com which has been sent to respective experts either through email or WhatsApp. Eight experts were selected to participate in the survey representative of local academicians, international academicians, and professional/experts from agencies. Within 2 weeks of the given time (due to a limited time), only 5 out of 8 experts undertook the survey and provided their feedback accordingly. They are 2 from local academicians, one international academician and 2 representatives from government agencies. The number of samples is considered enough without compromising the quality of the results obtained since points of view came from academicians, implementers, and practitioners.

RESULTS AND DISCUSSIONS

By having the identified key assessment elements as structured into levels, namely: dimension, criteria group and criteria, this research, therefore, has proposed a framework of modern rural development (FMRD) as a new approach for synergising rural change (Figure 2) – to measure rural development progress towards a modern village.

The FMRD is formulated as an objective mechanism of model assessment - a translation of all the key criteria required in modern rural development. There are three dimension-objectives measures proposed in the framework, namely: (1) Rural economic boosters and catalyst infrastructures to represent the resilient concept, (2) Rural characters and social well-being infrastructures (represent the liveable concept), and (3) Smart and green technology practices (represent the smart concept). Moreover, Dimension 1 comprises three criteria groups and 68 criteria, Dimension 2 with five criteria groups and 33 criteria, and Dimension 3 offers five criteria groups and 35 criteria – to form the total of 136 assessment criteria of the FMRD.

The proposed framework relies on the adequacy of rural infrastructures, facilities, services and technology practices, particularly in agricultural, entrepreneurship and tourism developments. Empowered by incorporating the best practices or ideas of a smart village approach into the existing Malaysia rural development approach of liveable and resilient which is embedded in the DPF Desa Negara 2030 and the DPLB 2030, it would be a booster for synergising and rejuvenating rural areas and as a 'missing link' approach to the implementation of the existing policies and strategies, particularly the DPF Desa Negara 2030 and the DPLB 2030.

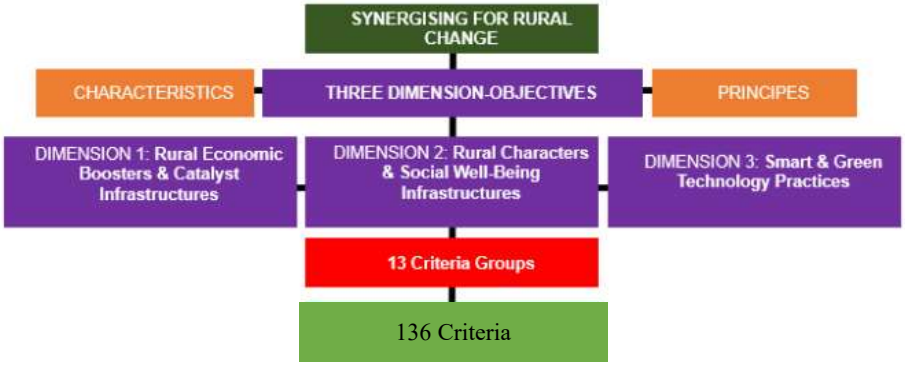

Figure 2: A framework of modern rural development

This section discusses the analysis of the results obtained from a single-round of the expert view survey. The analysis focuses on:

1. to rank the importance level of dimensions and criteria groups by calculating the mean values – where lower value is considered the most priority and so on, and,
2. to identify the relevant criteria to be used for further assessment of the modern rural development index. Only criteria that obtain 2 out of 5 values were selected.

Refining and Ranking of Dimensions and Criteria Groups by Priority Levels

Looking at each of the three dimensions, the results show that the dimension of rural economic boosters and catalyst infrastructures obtained the lowest mean value (or the most priority level), followed by rural characters and social well-being infrastructures and smart and green technology practices, thus, they have been ranked to 1, 2 and 3, respectively (Table 1).

Table 1: Mean value for each dimension and criterion group according to the judgement of priority level from experts

Dimensions	Criteria Groups	Priority Level by Experts (A to F)					*Mean Value	Rank
		A	C	D	E	F		
Rural Economic Boosters & Catalyst Infrastructures	Economic and Rural Services Centre (Town)	3	1	1	1	2	**1.6**	**1**
	Rural Growth Centre (RGC)	2	2	3	3	1	**2.2**	**2**
Mean value: 1.4 or ranked to 1	Rural economic cluster (agricultural, entrepreneurial, tourism)	1	3	2	2	3	**2.2**	**2**
Rural Characters & Social Well-Being Infrastructures	Efficient infrastructure	3	2	1	3	1	**2.0**	**1**
	Transportation networks of rural-town-city, and rural accessibility	4	1	3	1	3	**2.4**	**2**
	Rural governance (MPKK) and database	1	2	4	4	4	**3.0**	**3**
Mean value: 2.0 or ranked to 2	Internal village amenities	5	4	2	5	2	**3.6**	**4**
	Rural spatial characters and heritage	2	5	5	2	5	**3.8**	**5**
Smart & Green Technology Practices	Rural agricultural, infrastructures, technologies and innovations	1	5	1	1	1	**1.8**	**1**
	Rural entrepreneurial technologies and innovations	2	1	4	2	4	**2.6**	**2**
Mean value: 2.6 or ranked to 3	Rural marketing and e-commerce	5	2	3	3	2	**3.0**	**3**
	Smart and green technology practices	3	4	2	4	3	**3.2**	**4**
	Community-IoT-based smart technology practices	4	3	5	5	5	**4.4**	**5**

*where lower value is considered the most priority level and so on.

There are 3 criteria groups within the rural economic boosters & catalyst infrastructures. The relative importance level shows that the economic and rural services centre (town) becomes the most important (with 1.6 mean value) which ranked to level 1, and rural growth centre (RGC) and rural economic cluster (agricultural, entrepreneurial, tourism) obtained the same relative importance level to the position themselves at ranking 2.

Within the dimension of rural characters & social well-being infrastructures, efficient infrastructure has ranked to 1, followed by transportation networks of rural-town-city and rural accessibility, the lowest level of importance is rural spatial characters and heritage to rank at 5. Finally, among the five criteria

groups in the smart & green technology practices, rural agricultural, infrastructures, technologies and innovations are ranked top 1, followed by rural entrepreneurial technologies and innovations, rural marketing and e-commerce, and so on (see Table 1). It indicates that agriculture remains the most important sector for rural development in Malaysia, but there is a need to support other economic diversity as well as the smart and green technology practices, as synergy and stimulate factors to make rural areas growth better.

The Relevant/Additional Criteria for Modern Rural Development Framework

The experts were encouraged to rephrase or remove any criteria that they believed duplicated another criterion, and also to suggest additional criteria that suit the FMRD's aim. Therefore, some experts took the liberty to rephrase or make minor changes to the existing criteria and suggest a number of new potential criteria. By then, the suggestions from the experts ranged from rephrasing to remove the criteria due to duplication. To that extent, Table 2 outlines the finalised criteria after taking into action such as removed, added new and a little changed and rephrased them into a localised context.

Table 2: The finalised criteria by their dimensions and criteria groups

Dimension 1: Rural Economic Boosters & Catalyst Infrastructures (70 Criteria)
1 | *Economic and Rural Services Centre (Town)*
Economic Development: Mini market; Retail: food and beverage; Retail: home appliances; Retail: vehicle equipment; Retail: agricultural equipment; Souvenir Shop; Market/ Stall/ Bazaar; Farmer's Market/ Night Market/ Day Market; Restaurant; Food Court; Small-medium Business; Agricultural product collection centre; Petrol station; Insurance company; Hotel/ Boarding House/ Guest House. **Infrastructure Facilities:** Road network; Power and water supply; Telecommunication and ICT services; Bus Station/ Terminal; Bus stop; Railway station; Ferry/ Boat Terminal. **Service Centre:** Secondary school; Primary school; Kindergarten; Mosque; *Surau*; Church; Hindu temple; Buddhist temple; Cemetery; Health clinic; Rural clinic; Police station; Fire station; Multipurpose Hall; Public Hall; Community working hall (*Balai raya*); Rural library; Local Park; Neighbourhood Park; Playground; Bank; Registered bank agent; Rural Trade Centre (RTC). **Human Development:** Local Centre for Business and Consultation Services; Entrepreneurship skills training centre; Community Rehabilitation Programme (CRP).
2 | *Rural Growth Centre (RGC)*
Economic Development: Agricultural product collection centre; Small scale retail; Shop that supplies modern agriculture equipment and technology (including technical services); Workshop that provides services for maintenance/ repair of agricultural equipment; Hardware shop. **Infrastructure Facilities:** Road network; Power and water supply; Telecommunication, high-speed broadband and other ICT services; Public transport terminal. **Service Centre:** Community and recreational facilities; Mobile Community Transformation Centre (CTC); Registered bank agent. **Human Development:** Community Rehabilitation Programme (CRP); Elderly activity centre; Youth & innovation centre.
3 | *Rural economic cluster (agricultural, entrepreneurial, tourism)*
Tourist information centre; Homestay operated by the community through MPKK; and additional criteria; Cheap accommodation/ budget motel; Traditional and casual food premise concept; Permanent Food Production Farm (TKPM); Rural trade and retail; Broadband facilities for retailer and purchaser
Dimension 2: Rural Characters & Social Well-Being Infrastructures (33 Criteria)

1	*Rural spatial characters and heritage*
Rural boundary and mapping rural resources; Rural landmark (gateway, statue and welcoming signage); Excellent rural asset development award; Agricultural areas as buffer zone; New development of low-density housing (detached) suits with rural characters and B40; Adaptive reuse or restoration of old house; Preservation of traditional Malay house (or maintain the traditional archi-style; Individual registration as National Heritage Living Person (WAKOH).	
2	*Transportation networks of rural-town-city, and rural accessibility*
Bus stop for stage bus (500m distance from village); Shuttle train station; Water transport jetty; Rural paratransit stop (mini bus/van); Paved main entrance/access; Paved rural internal road; MyCar, Grab and any other e-hailing service providers.	
3	*Efficient infrastructure*
Continuous and adequate water supply; Extensive power supply; 1 Malaysia Internet Centre (PI1M); High-speed broadband; Fibre optic (fixed bandwidth) coverage; Cellular/ broadband coverage; Sanitary landfill; Recycling centre operated either by government-driven or partnership with the local community; Septic tank system.	
4	*Internal village amenities*
Mobile facilities (clinic and library); Community hall / rural community centre; *Surau;* Football field / recreation / sports; Healthcare centre (elderly, disabled people, and neglected mother); Temporary shelter/transit service for disaster (dedicated command centre in separation with school).	
5	*Rural governance (MPKK) and database*
MPKK working room; Rural community Co-operative centre; Rural village database managed by dedicated or paid staff.	
Dimension 3: Smart & Green Technology Practices (36 Criteria)	
1	*Rural agricultural, infrastructures, technologies and innovations*
Tractor; Plough; Harvesting machine; Micro-watershed management; Farmers Information System (FIS) and drone technology; Drone or UAV technology (crops monitoring and pest control); Smart database for agricultural through sensors and satellite data; Smart weather and irrigation system; Vertical farming; Vinyl greenhouse agriculture; Smart dairy through smart devices (livestock); Production of a high-demand agricultural products (Kenaf, vanilla, basmathi rice, *musang king*, stingless bee/ *lebah kelulut*, *burung walit*).	
2	*Rural entrepreneurial technologies and innovations*
Agro-industry basic facilities (i.e. incubator centre for up to district scale) (incubator); Community biogas plant for entrepreneurship activities; Market analysis tools/ software; Village community radio; Telecommunication and video conferencing; ICT related materials & outsourcing training; Mentor-mentee training programme or rural icon in business.	
3	*Rural marketing and e-commerce*
Fresh fruit stall (GBBS); Agrobazaar; KShoppe; Training centre and e-commerce services (equipped with high-speed broadband).	
4	*Village smart and green technology practices*
Rainwater harvesting; Renewable energy (through solar rooftop PV, solar micro grid, micro-hydroelectric, solar farming); Generate energy through biogas digestion; Solar cookers; LEDs; Low-energy motors; Flood risk alarming through smart phone; Biochar for transforming garden waste into organic fertilisers – waste-to-wealth.	
5	*Community-IoT-based smart technology practices*
Smart healthcare facilities/ healthcare mobile apps; Waste monitoring and management system through wireless sensor monitor; Smart education (through videos, smart classroom, fun-toy library); CCTV cameras/ Smart surveillance system; Goods and services delivery system via mobile apps.	

As a result, the finalised criteria for the FMRD are 139 criteria by adding up three more to the earlier proposed. 70 from Dimension 1, 33 from Dimension 2 and the remaining 36 from Dimension 3 – are very important to materialise the capabilities of the FMRD as a missing link for synergising rural change in sustainable and prosperity ways, and more importantly, reflect the people's aspirations in fulfilling the livelihoods. These criteria need to be endorsed as a new assessment measure to modern rural development in Malaysia.

CONCLUSIONS

This research has introduced the modern rural development framework (the FMRD). That is, an integrated approach between the smart village and liveable and resilient concepts, aimed at synergising rural change in terms of physical, economic, social and technology practices. The FMRD is designed based on three dimension-objective measure which in turn comprised of 13 criteria groups and 139 criteria finalised from the single-round expert view survey. It is evident that the stages, analyses, and interpretations in this research need to be endorsed since the elements discussed help identify the emerging new paradigm shift in villages and societies' approach in the rural areas. Moreover, the FMRD is a timely approach for the rural assessment to maximise the rural performance towards establishing future niches in Malaysia - rural liveability-resilient-and-smart. However, at this stage it remains as a measurement idea until it undertakes real case studies. It shall be demonstrated in other work to come.

ACKNOWLEDGEMENT

This paper is part of a project funded by the National Real Property Research Coordinator (NAPREC), National Institute of Valuation (INSPEN), Valuation & Property Services Department (JPPH), Ministry of Finance, Malaysia.

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Received: 17th May 2021. Accepted: 9th July 2021