



4TH INTERNATIONAL INTERDISCIPLINARY CONFERENCE ON **GREEN DEVELOPMENT IN TROPICAL REGION**

The Development of an Environmental Resilience Index for Selangor, Malaysia

Sharifah Husna Syed Zainal Yussof ¹
M. Zainora Asmawi ¹
Illyani Ibrahim ¹
Wan Nurul Mardhiah Wan Mohd Rani ²

¹ Department of Urban and Regional Planning,
International Islamic University Malaysia.

² Institute Sultan Iskandar, Block J1, UTM,
Jalan Sultan Yahya Petra, Kuala Lumpur.



Virtually held by Graduate Program Universitas Andalas - 7 July 2021 & 8 July 2021



CONTENTS

1

Introduction & Research background

2

In the news

3

Looking back & the start of a new paradigm

4

International commitments

5

National statutes, plans, policies & guideline

6

Mechanism for measuring environmental components

7

Introduction to Environmental Resilience Index

8

ERI pilot analysis

9

Mapping of ERI analysis

10

Conclusion



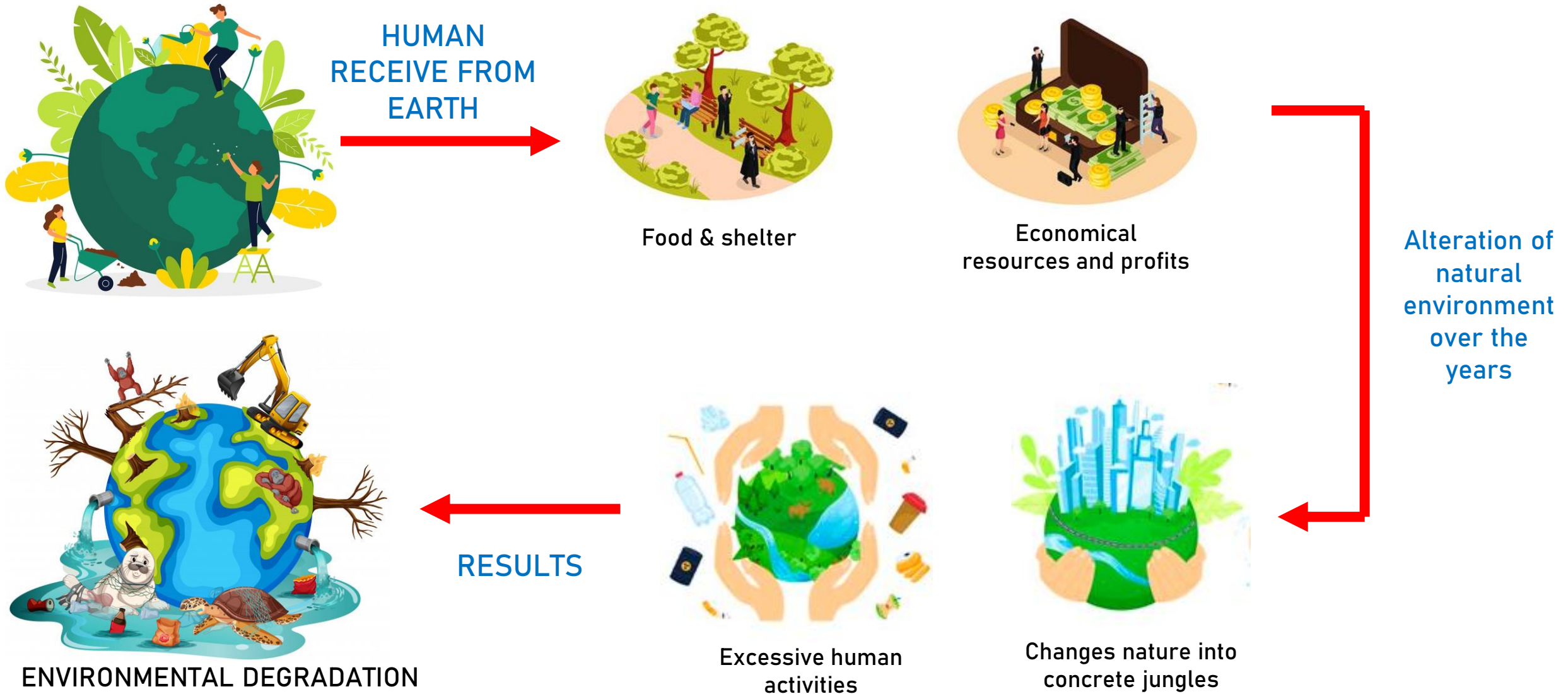
Kuala Selangor Nature Park

@kamaliahusna

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



INTRODUCTION & RESEARCH BACKGROUND



4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021

IN THE NEWS

Selangor clearing another peat swamp forest without EIA, say groups



Aminah Farid

Updated 2 months ago · Published on 8 Apr 2021 7:00AM · 2 Comments



HOME MALAYSIA

Air Selangor: Landslide at Damansara Utama causes water disruption in Petaling region

Wednesday, 30 Dec 2020 11:01 AM MYT
BY ALEXANDER WONG



the latest unscheduled water disruption is caused by a broken distribution pipe due to a landslide in Damansara Utama. — Picture by Mukriz Hazim

#BuatUnlimitedSendiri

The best customisable Unlimited Plan now comes with Free 6GB* hotspot and voice!

Yodo

Learn More

IN MALAYSIA

JUST IN POPULAR

12 minutes ago
Dr Annuar: Sibul Division on track to inoculate 70pc of population

21 minutes ago
Dr Noor Hisham: Over 92,000 RTK-Ag tests conducted yesterday



the latest unscheduled water disruption is caused by a broken distribution pipe due to a landslide in Damansara Utama. — Picture by Mukriz Hazim

Environmental crisis heating up, urgent action needed

By CLARISSA CHUNG



NATION

Thursday, 22 Apr 2021

Related News



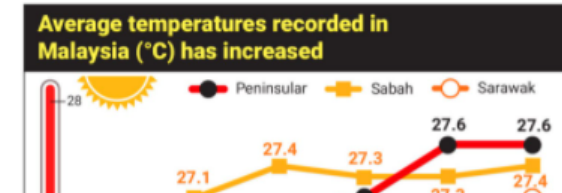
METRO NEWS 15h ago
Iskandar Malaysia green agenda to continue with two initiatives

NATION 05 Jun 2021
h still needs our

PETALING JAYA: On Earth Day today, environmental activists are calling for greater climate action especially as the world, including Malaysia, has been recording hotter temperatures in recent years.

Global Environment Centre director Faizal Parish said from 1969 to 2015, the annual minimum temperature in Peninsular Malaysia had risen by 1.4°Celsius.

"Sea levels have risen by 5cm (on average) from 1993 to 2015. It is predicted to rise by 50cm in Peninsular Malaysia and 1.06m in Sabah by the year 2100," he said, adding that this would lead to coastal flooding and erosion.



Five districts in Selangor flooded



NATION

Monday, 20 Jul 2020



Malaysia's coral reefs in 'fair condition', needs stronger local management, says survey



CLIMATE

Wednesday, 21 Apr 2021
8:00 AMMYT

Related News



INDONESIA 07 Jun 2021
Saving Bali's coral ecosystem



92 Malayan tapirs killed in five years due to road accidents in the country



4th International Interdisciplinary Conference on Green Development in Tropical Region - Graduate Program Universitas Andalas - 7 July 2021 & 8 July 2021



LOOKING BACK



King Asoka of India

252 BC

Announce protection of
wildlife, fisheries &
forest habitat



Prophet Muhammad

624 –
634 AD

Declare conservation
areas 'Hima' حِمَى in
Madinah



King William I of England

1084 AD

Summoned the provision
of The Domesday Book
(land inventory)

Source: [2]

A START OF A NEW PARADIGM

1987

BRUNTLAND COMMISSION

SUSTAINABILITY

'Development that
meets the needs of
the future without
compromising the
ability of the future
generation to meet
their needs'.



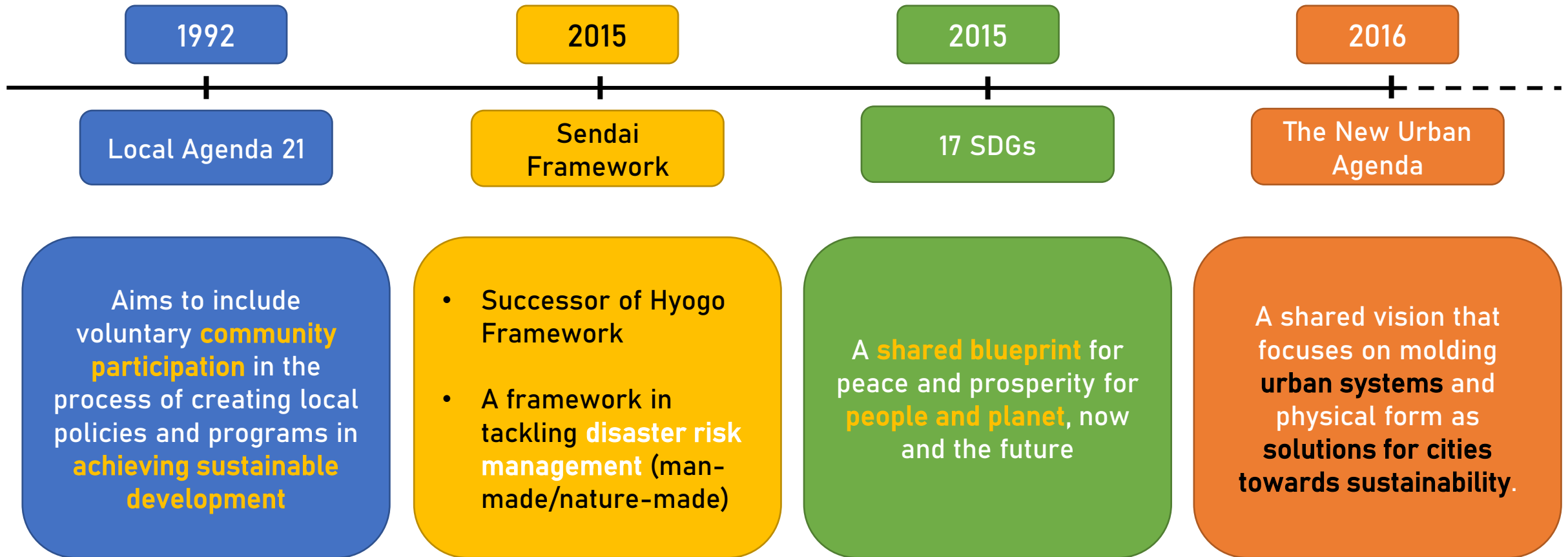
RESILIENCE

'The ability of a city
to absorb
disturbance and
recover its
function after
disturbance'.

Lhomme (2013)

Source: [3-4]

INTERNATIONAL COMMITMENTS



Source: [5-8]

STATUTORY PLANS



National Physical Plan



State Structure Plan

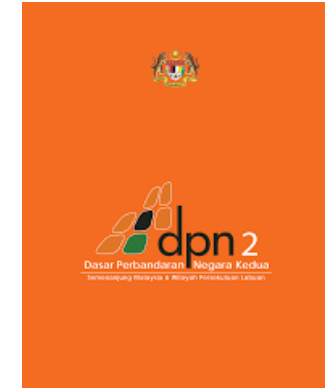


Local Plan

NATIONAL PLANS



Eleventh Malaysia Plan

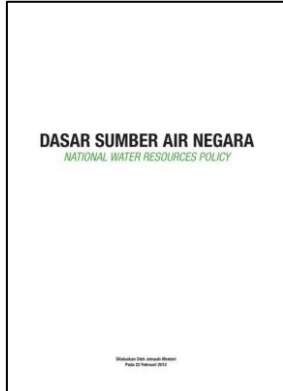


National Urbanization Plan

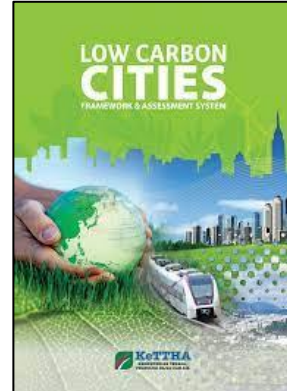


National Rural Development Plan

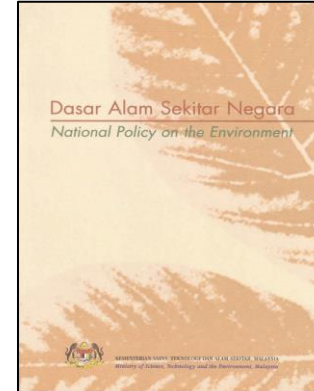
NATIONAL POLICIES & GUIDELINE



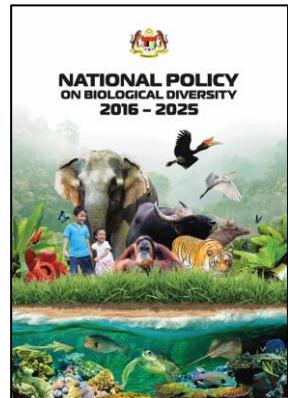
National Water Resources Policy



Low Carbon Cities Framework & Assessment System



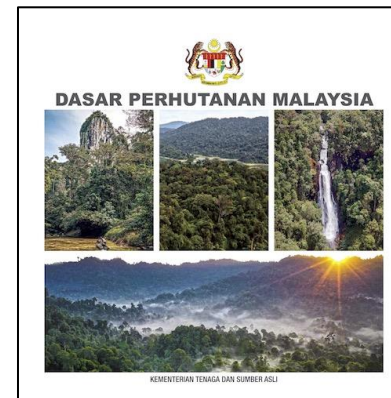
National Policy on Environment



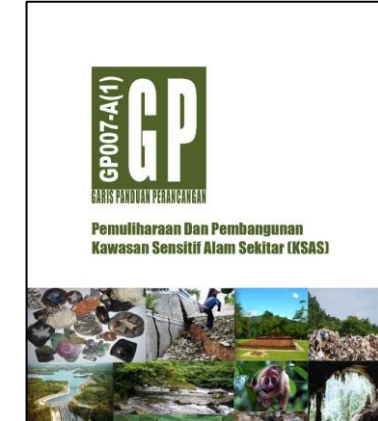
National Policy on Biological Diversity



National Policy on Climate Change



Malaysian Forestry Policy



Development Guidelines for Environmental Sensitive Areas

A compilation of guidelines:

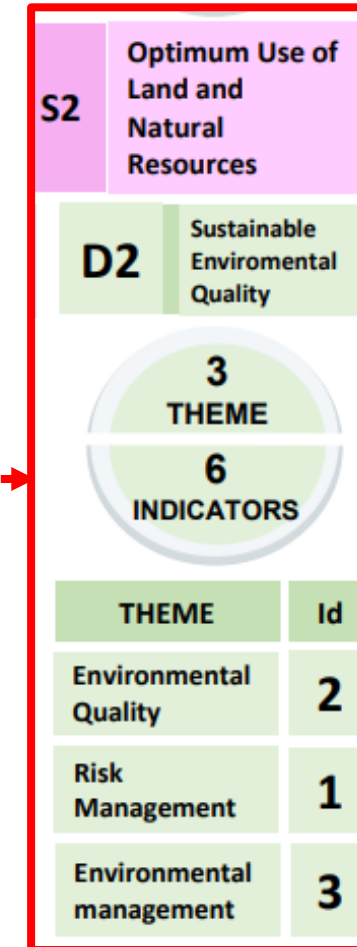
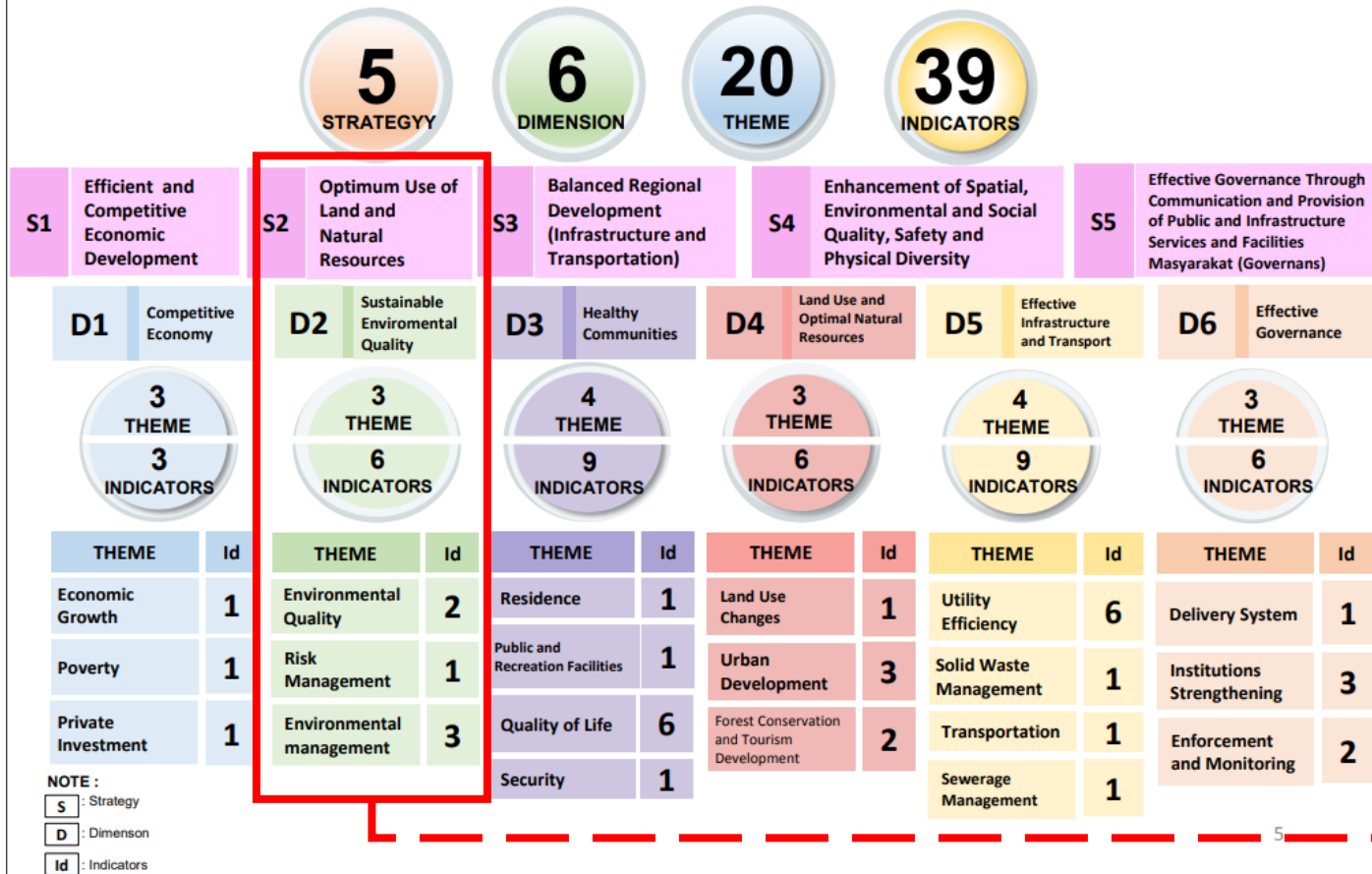
- i. Coastal areas
- ii. Water catchment areas
- iii. Flood-prone areas
- iv. Mineral reserves
- v. Solid waste disposal sites
- vi. Agricultural areas
- vii. Wildlife reserves
- viii. Forest areas
- ix. Cultural & heritage area

Source: [9-23]

MECHANISM FOR MEASURING ENVIRONMENTAL COMPONENTS

Malaysian Urban-Rural Indicators Network for Sustainable Development (MURNINets)

MURNINets 2.0 Framework



- Theme on environmental resources are missing
- Fill in the existing gap
- To develop a holistic framework in measuring the environmental resilience.

Source: [24]

INTRODUCTION TO ENVIRONMENTAL RESILIENCE INDEX (ERI)

Sungai Ulu Kalong, Selangor

@kamaliahusna

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



FRAMEWORK FOR ENVIRONMENTAL RESILIENCE INDEX

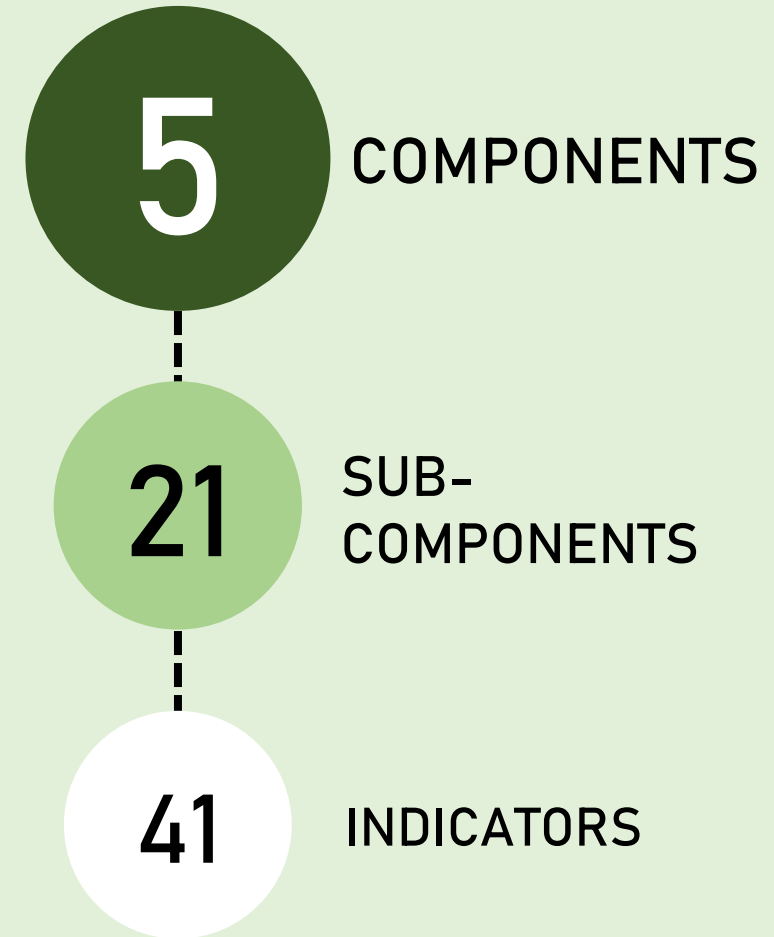
AIM

To develop a methodological framework to measure the level of resilience, namely Environmental Resilience Index (ERI) for towns in Malaysia that could be used by stakeholders, especially Local Planning Authorities.

OBJECTIVES

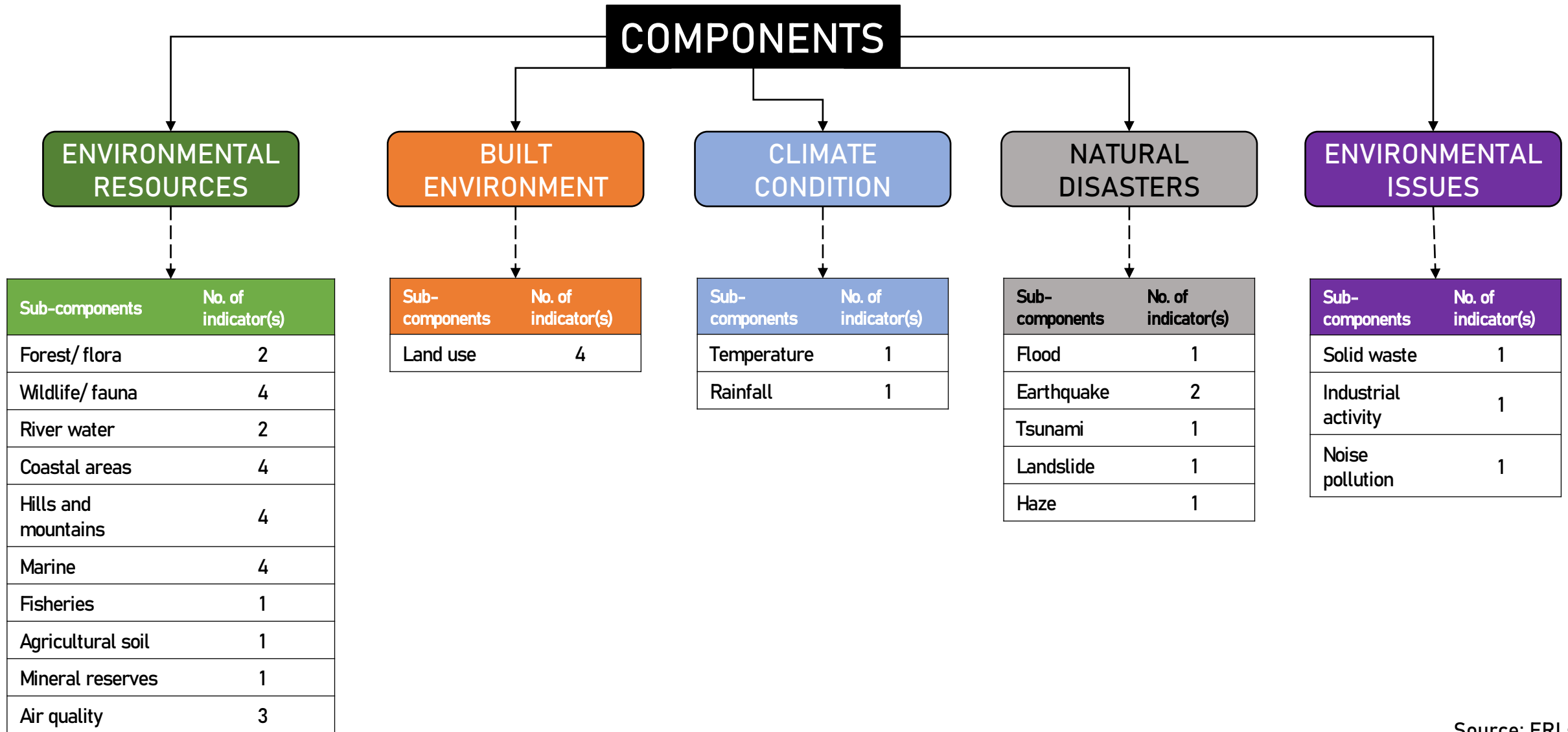
1. To identify key components, sub-components and indicators for Environmental Resilience Index (ERI).
2. To generate the ERI results and to understand the spatial distribution pattern.
3. To produce a model of ERI in the GIS database system.

FRAMEWORK



Source: ERI study

DETAILS OF ERI FRAMEWORK



Source: ERI study

ERI PILOT ANALYSIS: ENVIRONMENTAL RESOURCES

Bukit Tabur, Selangor

@kamaliahusna

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



ERI PILOT ANALYSIS: ENVIRONMENTAL RESOURCES

COMPONENT	SUB-COMPONENT	INDICATORS	Units	LOW 1	MODERATE 2	HIGH 3	NIL 0
Environmental Resources 10 sub-components 26 indicators	Forest/flora	Forest area	hec.	1% - 25%	26% - 50%	>50%	0%
		Forest loss	hec.	decrease > 3000	decrease 1 - 1500	0 or increases	
	Wildlife/fauna	Endangered species	no.	1-5	5-10	>10	0
		Wildlife reserve	hec.	1 - 500	501 - 1000	>1000	0
		Important bird areas (IBA)	hec.	1 - 500	501 - 1000	>1000	0
		Central forest spine (CFS)	hec.	1 - 500	501 - 1000	>1000	0
	River water	Water quality	WQI	POLLUTED	SEMI-POLLUTED	CLEAN	
		Dam/reservoir	hec.	1 -100	101 - 200	>200	0
	Coast	Sandy beach	hec.	>1000	501 -1000	1 - 500	NA
		Mangrove beach	hec.	1 - 500	501 - 1000	>1000	NA
		Water quality@beach	WQI	POLLUTED	SEMI-POLLUTED	CLEAN	NA
		Erosion	hec.	1 -10	11 - 20	>20	NA
	Hills & mountains	Flat area (<150m)	hec.	>100	50 - 100	1-49	0
		Undulating area (150-300m)	hec.	>100	50 - 100	1-49	0
		Hill (300-1,000m)	hec.	1 - 500	501 - 1000	>1000	0
		Mountain (>1,000m)	hec.	1 - 500	501 - 1000	>1000	0
	Marine	Marine water quality	WQI	POLLUTED	SEMI-POLLUTED	CLEAN	ND
		Coral reef area	WQI	0 - 1	1 - 2	>2	ND
		Marine life species	no.	0-10	11 - 20	>20	ND
		Live Coral Cover (LCC)	class	Poor	Fair & good	Excellent	ND
	Fisheries	Fisheries productivity	tonnes	1 - 500	501 - 1000	>1000	0
	Agricultural soil	Class 1 (agriculture)	hec.	1 - 500	501 - 1000	>1000	0
	Mineral reserves	Mining areas	hec.	>1000	501 - 1000	1 - 500	0
	Air quality	API (Good)	no. of days	1 - 100	101 - 150	>150	0
		API (Moderate)	no. of days	1 - 100	101 - 150	>150	0
		API (Not healthy)	no. of days	1 - 100	101 - 150	>150	0

Source: ERI study

ERI PILOT ANALYSIS: ENVIRONMENTAL RESOURCES

District	Sub-component	Forest/Flora	Fauna/ Wildlife	River water	Coastal areas	Hills & mountains
	Code	ER 1	ER 2	ER 3	ER 4	ER 5
	Score/comp	6	12	6	12	12
Sabak Bernam		3	1	3	5	1
Kuala Selangor		4	7	2	9	6
Hulu Selangor		4	11	6	0	6
Klang		2	4	2	5	1
Petaling		4	1	4	0	5
Gombak		5	7	5	0	6
Kuala Langat		4	4	2	6	1
Hulu Langat		4	8	5	0	4
Sepang		3	1	2	5	1

ERI PILOT ANALYSIS: ENVIRONMENTAL RESOURCES

District	Sub-component	Marine areas	Fisheries	Agriculture	Mineral reserves	Air quality
	Code	ER 6	ER 7	ER 8	ER 9	ER 10
	Score/comp	12	3	3	3	9
Sabak Bernam		0	3	3	0	9
Kuala Selangor		2	3	3	0	5
Hulu Selangor		0	3	3	3	5
Klang		2	3	3	0	5
Petaling		0	1	2	0	5
Gombak		0	3	3	3	5
Kuala Langat		2	3	3	0	5
Hulu Langat		0	3	3	1	5
Sepang		3	3	3	0	5

Source: ERI study

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



ERI PILOT ANALYSIS: ENVIRONMENTAL RESOURCES

District	Total score	Received score/ district	ERI Level	COMPOSITE ERI FOR SELANGOR
	78			
Sabak Bernam		24	Low	AVERAGE SCORE 30.8
Kuala Selangor		41	Moderate	
Hulu Selangor		41	Moderate	
Klang		27	Moderate	
Petaling		18	Low	ERI LEVEL MODERATE
Gombak		37	Moderate	
Kuala Langat		30	Moderate	
Hulu Langat		33	Moderate	
Sepang		26	Low	

	ERI level	ERI score
	Low	1 – 26
	Moderate	27 – 52
	High	53 – 78

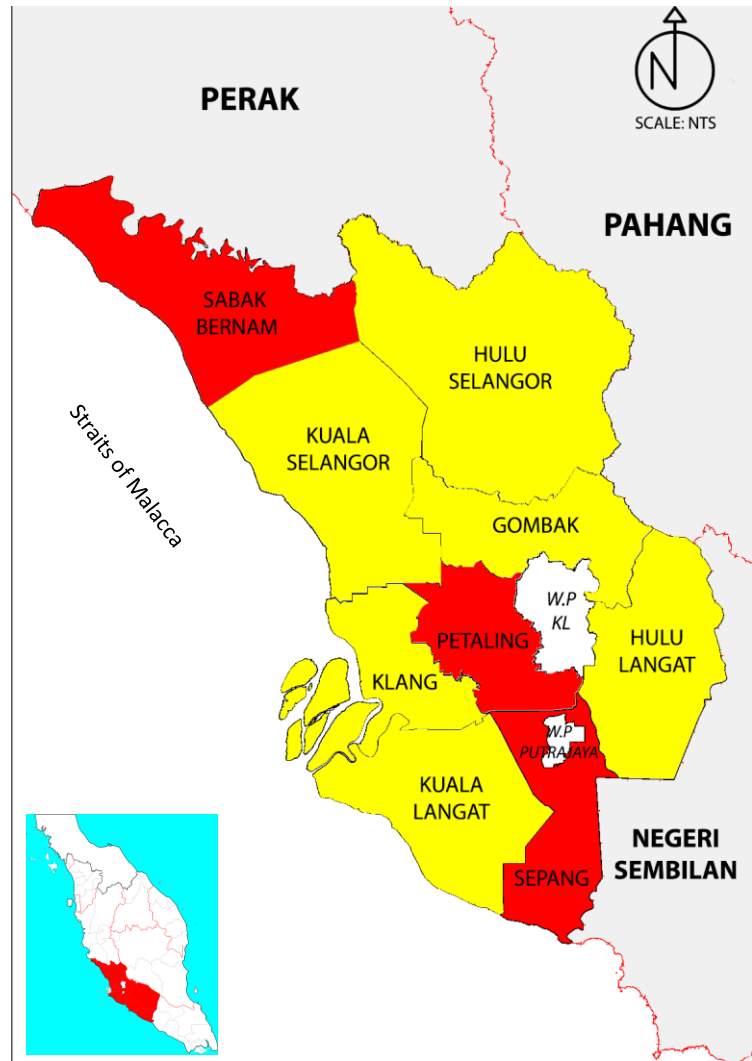
Source: ERI study

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



MAPPING OF ERI PILOT ANALYSIS

ERI RESULTS FOR 9 DISTRICTS IN SELANGOR



LEGEND		
	ERI level	ERI score
	Low	1 – 26
	Moderate	27 – 52
	High	53 – 78

COMPOSITE ERI RESULT FOR SELANGOR

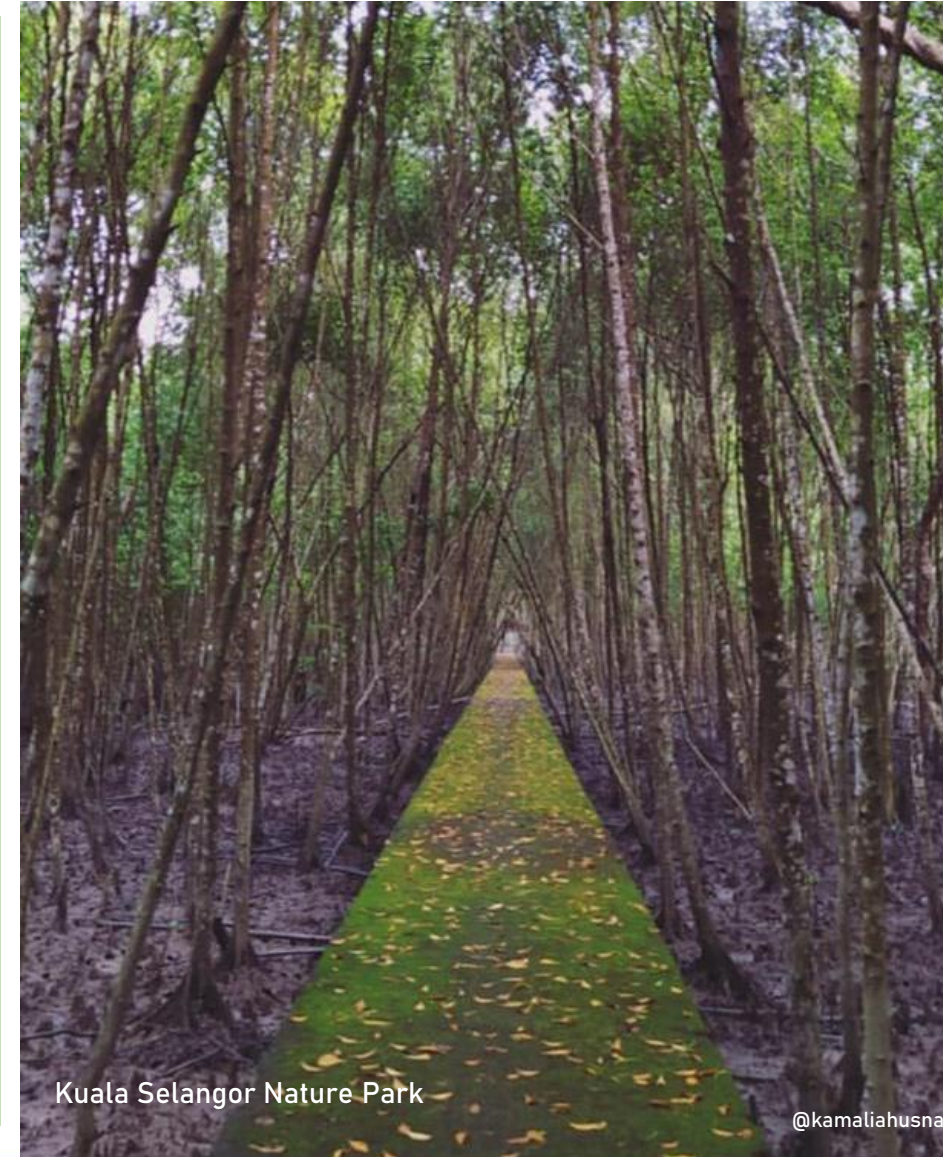


Source: ERI study

CONCLUSION

Through the analysis of ERI, it enables stakeholders, particularly LPA to :

1. Understand the overall environmental RESILIENCE performance of a district (natural & anthropogenic factors).
2. Improve the components that are of lower performance to ensure the environmental resilience are achieved, in line with SDG initiatives.



Kuala Selangor Nature Park

@kamaliahusna

“If you really think the economy
is more important than the
environment, try holding your
breath whilst you count your
money.”

Dr GUY McPHERSON

ACKNOWLEDGEMENT:
Fundamental Research Grant Scheme
(FRGS19-066-0674, FRGS/1/2018/TK10/UIAM/02/1).

Batu Caves, Selangor

@kamaliahusna

4th International Interdisciplinary Conference on **Green Development in Tropical Region - Graduate Program Universitas Andalas** - 7 July 2021 & 8 July 2021



REFERENCES

- [1] A. Gupta and M. G. Asher, *Environment and the developing world: principles, policies, and management*. John Wiley & Sons, Ltd. (UK), 1998.
- [2] R. A. M. Yamin, *Islam dan Pemuliharaan Biodiversiti*. Kuala Lumpur: Institut Kefahaman Islam Malaysia, 2019.
- [3] M. Keiner, "History, definition(s) and models of sustainable development," 2005.
- [4] S. Meerow, J. P. Newell, and M. Stults, "Defining urban resilience: A review," *Landsc. Urban Plan.*, vol. 147, pp. 38–49, 2016.
- [5] U. E. Management, "Local Agenda 21," 2020. .
- [6] U. Nations, *Sendai Framework for Disaster Risk Reduction 2015-2030*. 2015.
- [7] S. Development *et al.*, "Why the World Needs an Urban SDG," pp. 1–6, 2015.
- [8] URBACT, "Take-aways from HABITAT III and the New Urban Agenda," 2019. .
- [9] L. R. Board, *National Land Code (Act 56 of 1965)*. Malaysia, 2015.
- [10] U. N.- Habitat, "Town and Country Planning Act 1976." [Online]. Available: <https://urbanlex.unhabitat.org/law/397>. [Accessed: 21-Jun-2021].
- [11] Kementerian Tenaga dan Sumber Asli, "Dasar Perhutanan Malaysia," *Kementerian. Tenaga dan Sumber Asli*, p. 136, 2021.
- [12] T. and the E. M. Ministry of Sains, "Dasar Alam Sekitar Negara.Pdf." p. 29, 2017.
- [13] M. Ministry of Natural Resources and Environment, *National Policy on Climate Change*. 2009.
- [14] M. Minstry of Energy, Green Technology and Water, *Low Carbon Cities Framework and Assessment System*. 2011.
- [15] PLANMalaysia, *Garis Panduan Perancangan Pemuliharaan Dan Pembangunan Kawasan Sensitif Alam Sekitar (KSAS)*. 2017.
- [16] Food and Agriculture Organization of the United Nations, "Environmental Quality Act 1974." [Online]. Available: [http://www.fao.org/faolex/results/details/en/c/LEX-FAOC013278/#:~:text=Environmental Quality Act 1974 \(No.&text=An Act relating to the,and enhancement of the environment. \[Accessed: 21-Jun-2021\].](http://www.fao.org/faolex/results/details/en/c/LEX-FAOC013278/#:~:text=Environmental Quality Act 1974 (No.&text=An Act relating to the,and enhancement of the environment. [Accessed: 21-Jun-2021].)
- [17] M. Ministry of Economic Affairs, *Rancangan Malaysia Kesebelas 2016-2020*. 2015.
- [18] JPBD Semenanjung Malaysia, "Dasar perbandaran negara," 2016.
- [19] P. dan K. T. PLANMalaysia (Jabatan Perancangan Bandar Dan Desa) Kementerian Kesejahteraan Bandar, "Dpf Desa Negara(Ringkasan Eksekutif)," vol. 106, no. 11, pp. 1323–1330, 2002.
- [20] A. Perancangan, "Rancangan Fizikal Negara Ketiga (RFN Ke-3) menetapkan rangka kerja perancangan dan pembangunan spatial untuk diterjemahkan kepada strategi dan tindakan perancangan di peringkat negara, negeri dan tempatan," pp. 1–10, 2020.
- [21] J. P. B. dan D. N. Selangor, *Rancangan Struktur Negeri Selangor 2035*, vol. 70. Malaysia, 2015.
- [22] N. Water and R. Policy, "Dasar sumber air negara," 2012.
- [23] M. Ministry of Natural Resources and Environment, *National Policy on Biological Diversity 2016 - 2025*. 2016.
- [24] PLANMalaysia, "MALAYSIAN URBAN RURAL NATIONAL INDICATORS NETWORK ON," pp. 1–7.
- [25] anshul S. Bharm, "Resilience framework for measuring development," *Br. GSDR 2015*, 2015.
- [26] P. Romero-Lankao, D. M. Gnatz, O. Wilhelmi, and M. Hayden, "Urban sustainability and resilience: From theory to practice," *Sustain.*, vol. 8, no. 1224, 2016.
- [27] A. Sharifi and Y. Yamagata, "Resilient urban planning: Major principles and criteria," *Energy Procedia*, vol. 61, pp. 1491–1495, 2014.
- [28] M. Suárez, E. Gómez-Baggethun, J. Benayas, and D. Tilbury, "Towards an urban resilience index: A case study in 50 Spanish cities," *Sustain.*, vol. 8, no. 8, 2016.
- [29] W. N. M. Wan Mohd Rani, K. H. Kamarudin, K. A. Razak, R. Che Hasan, and Z. Mohamad, "Measuring urban resilience using climate disaster resilience index (CDRI)," *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci. - ISPRS Arch.*, vol. 42, no. 4/W9, pp. 237–242, 2018.
- [30] Arcadis, "Citizen Centric Cities : The Sustainable Cities Index 2018," 2018.
- [31] S. Morse, "Environmental Performance Index 2020," *Rise Rise Indic.*, pp. 102–123, 2019.
- [32] C. R. Pratt, U. L. Kaly, and J. Mitchell, "Manual: How to Use the Environmental Vulnerability Index (EVI).," *SOPAC Tech. Rep. 383.*, p. 98, 2004.
- [33] Yale Center for Environmental Law & Policy; Yale University and C. U. Center for International Earth Science Information Network, "2005 Environmental Sustainability Index," 2005.
- [34] S. Goundar, "Chapter 3 – Research Methodology and Research Method," no. May, 2019.



Berkelah Waterfall, Pahang

@kamaliahusna



4TH INTERNATIONAL INTERDISCIPLINARY CONFERENCE ON GREEN DEVELOPMENT IN TROPICAL REGION

Virtually held by Graduate Program Universitas Andalas - 7 July 2021 & 8 July 2021

