

DRAINAGE BASIN DYNAMICS : A Geographical Perspective

Editors:

Mohmadisa Hashim¹, Dewi Liesnoor Setyowati², Nasir Nayan³

Email:

mohmadisa@fsk.upsi.edu.my¹, dewi@uui.com²,
nasir @fsk.upsi.edu.my³

Abstract: This book entitles Drainage Basin Dynamics: A Geographical Perspective is conceptualized with research experience from two universities in Malaysia (Universiti Pendidikan Sultan Idris) and Indonesia (Universitas Negeri Semarang). A total of 32 researchers have contributed chapters. The research translated into chapters is based on the real experience of the author/researcher. This book provides readers with research that has been conducted in Malaysia and Indonesia with the main focus on river basins from a geographical perspective. This book summarizes research on river basins that are unlimited and can be multiplied further. A river basin is a natural entity found on the earth's surface. Physically it is an area that is drained by the major river and its tributaries and is very important to live in it whether to humans, flora and fauna. Drainage basins are not static but dynamic because they change because of natural and human factors. However, the changes that occur in the river basin today are because of human intervention that has explored and developed the drainage basin area in the name of development. This book attempts to delve into issues related to the physical and human geography in providing dynamics that occur in a drainage basin.

Keywords: Geographical, drainage, intervention, dynamics



DRAINAGE BASIN DYNAMICS

A Geographical Perspective



Editors

Mohmadisa Hashim
Dewi Liesnoor Setyowati
Nasir Nayan



Penerbit
UTHM

DRAINAGE BASIN DYNAMICS

A Geographical Perspective

Editors

**Mohmadisa Hashim
Dewi Liesnoor Setyowati
Nasir Nayan**


**Penerbit
UTHM**
2022

© Penerbit UTHM
First Published 2022

Copyright reserved. Reproduction of any articles, illustrations and content of this book in any form be it electronic, mechanical photocopy, recording or any other form without any prior written permission from The Publisher's Office of Universiti Tun Hussein Onn Malaysia, Parit Raja, Batu Pahat, Johor is prohibited. Any negotiations are subjected to calculations of royalty and honorarium.

Perpustakaan Negara Malaysia Cataloguing-in-Publication Data

DRAINAGE BASIN DYNAMICS : A Geographical Perspective/
Editors Mohmadisa Hashim, Dewi Liesnoor Setyowati, Nasir Nayan.

ISBN 978-967-2817-75-8

1. Watersheds.
 2. Watershed management.
 3. Government publications--Malaysia.
- I. Mohmadisa Hashim. II. Dewi Liesnoor Setyowati.
III. Nasir Nayan.
551.48

Published & Printed by:
Penerbit UTHM
Universiti Tun Hussein Onn Malaysia
86400 Parit Raja,
Batu Pahat, Johor
Tel: 07-453 8698 / 8529
Fax: 07-453 6145

Website: <http://penerbit.uthm.edu.my>
E-mail: pt@uthm.edu.my
<http://e-bookstore.uthm.edu.my>

Penerbit UTHM is a member of
Majlis Penerbitan Ilmiah Malaysia
(MAPIM)

Table of Contents

| | |
|------------------------|------------|
| <i>List of Tables</i> | <i>xi</i> |
| <i>List of Figures</i> | <i>xv</i> |
| <i>Preface</i> | <i>xix</i> |

CHAPTER 1

| | |
|--|---|
| Drainage Basin Dynamics: An Overview | 1 |
| <i>Mohmadisa Hashim, Dewi Liesnoor Setyowati and Nasir Nayan</i> | |

CHAPTER 2

| | |
|--|----|
| Water Management Analysis and Carrying Capacity for Watersheds Conservation in Garang, Semarang, Indonesia | 11 |
| <i>Dewi Liesnoor Setyowati, Sucihatningsih DPW, Suroso and Muhammad Amin</i> | |
| Introduction | 11 |
| Garang Watershed, River Discharge, Flood, and Flash Flood | 15 |
| Watershed Carrying Capacity for River Control | 18 |
| Efforts for Watershed Conservation | 23 |
| Conclusion | 30 |

CHAPTER 3

| | |
|---|----|
| Assessment of Flood Water Quality in Kuala Krai District, Kelantan, Malaysia | 31 |
| <i>Nasir Nayan, Mohmadisa Hashim, Yazid Saleh, Hanifah Mahat and Koh Liew See</i> | |
| Introduction | 31 |
| Concept of Flood and Water Quality | 33 |
| Flood Events and Water Quality Issues | 35 |
| Flood History in Kuala Krai, Kelantan | 44 |
| Flood Water Quality Standard Assessment | 48 |

| | |
|--|----|
| National Water Quality Index (NWQI) of Malaysia | 48 |
| Water Quality for Physical and Chemical Parameters | 49 |
| Water Quality for Biological Parameters | 50 |
| Flood Water Quality Index at Flood Evacuation Centre | 51 |
| Conclusion | 52 |
| Acknowledgement | 53 |

CHAPTER 4

| | |
|--|----|
| Long-term Rainfall Variability and Trend in the Kinta River Basin, Perak, Malaysia <i>Mohmadisa Hashim, Wan Ruslan Ismail, Nasir Nayan, Hanifah Mahat and Yazid Saleh</i> | 55 |
| Introduction | 55 |
| Long-term Rainfall Variability and Trends in River Basins | 56 |
| Variability and Changes of Long-Term Rainfall in the KRB | 63 |
| Changes and Variability of Annual Rainfall in the KRB | 64 |
| Changes and Variability of Monthly Rainfall in the KRB | 72 |
| Changes and Variability of Rainfall by Season in the KRB | 75 |
| Conclusion | 80 |

CHAPTER 5

| | |
|---|----|
| Variations in Suspended Sediment Concentration during Storm Events in Bernam Sub Catchment, Perak Malaysia <i>Sumayyah Aimi Mohd Najib, Syazwani Aliah and Husna Nabilah Hamidon</i> | 81 |
| Introduction | 81 |
| Characteristics of Bernam River | 82 |
| Storm Event Characteristics | 84 |
| Varied Concentrations during Storm Event and Loadings | 85 |
| Conclusion | 88 |

CHAPTER 6

| | |
|--|-----|
| Physico-Chemical Parameters and Water Quality of Slim River, Perak, Malaysia <i>Wan Ruslan Ismail, Mohamad Adam Omar, Siti Fadzilatulhusni Mohd Sani, Noraini Misnan and Sumayyah Aimi Mohd Najib</i> | 89 |
| Introduction | 89 |
| Slim River Catchment | 90 |
| Physico-Chemical Paramaters | 95 |
| Rainfall | 95 |
| Temperature | 96 |
| Conductivity (CND) and Total Dissolved Solid (TDS) | 97 |
| Dissolved Oxygen (DO) | 97 |
| pH and Salinity | 98 |
| Turbidity | 98 |
| Total Suspended Solid (TSS) | 100 |
| Nitrogen | 100 |
| Phosphate | 101 |
| Conclusion | 103 |
| Acknowledgement | 103 |

CHAPTER 7

| | |
|---|-----|
| Land Conversion and Decrease in Environmental Carrying Capacity of Kreo Sub-Watershed in Semarang City, Indonesia <i>Hariyanto, Erni Suharini and Wahyu Setyaningsih</i> | 105 |
| Introduction | 105 |
| Changes in the Ecological Footprint | 109 |
| Changes in Bio-Capacity | 111 |
| Changes in Environmental Carrying Capacity | 112 |
| Conclusion | 114 |

CHAPTER 8

| | |
|---|-----|
| Trend of Land Use Change at the Garang Watershed, Central Java Province from 2001 - 2019 <i>Tjaturahono Budi Sanjoto and Saryono</i> | 115 |
| Introduction | 115 |
| The Concept of Land Use | 117 |
| The Description of Garang Watershed | 119 |
| Land Use Change in Garang Watershed | 120 |
| Conclusion | 127 |

CHAPTER 9

| | |
|---|-----|
| A Review of the Impact of Urban Green Park on Urban Ecosystems <i>Madeline Henry Luyan, Nasir Nayan and Mohmadisa Hashim</i> | 129 |
| Introduction | 129 |
| Defining the Urban, City and the Ecosystems | 130 |
| The Urban City | 130 |
| Urban Green Park | 131 |
| Types of Urban Green in Malaysia | 132 |
| Urban Ecosystems | 135 |
| Urbanization and its Impact on the Environment | 136 |
| Influence of Greenhouse Gases on the Surrounding Ecosystem | 137 |
| The Role of Plants in Moderating Urban Climate | 138 |
| Urban Development Planning in Malaysia | 140 |
| Conclusion | 141 |
| Acknowledgement | 141 |

CHAPTER 10

| | |
|---|-----|
| Population Dynamics of Tuntang Watershed Semarang Regency, Indonesia <i>Puji Hardati</i> | 143 |
| Introduction | 143 |

| | |
|--|-----|
| Charateristics of Tuntang Watershed | 146 |
| Population Dynamics in Tuntang Watershed | 151 |
| Conclusion | 159 |

CHAPTER 11

| | |
|---|-----|
| Sustainable Agriculture Management in the Juwana Sub-Watershed, Indonesia | 161 |
| <i>Eva Banowati, Aprillia Findayani and Adhitya Prasetya Adji</i> | |
| Introduction | 161 |
| Agriculture Activity in Juwana Watershed | 164 |
| Sustainable Agriculture Concept | 166 |
| Community and Sustainable Agriculture in Juwana Watershed | 169 |
| Conclusion | 173 |

CHAPTER 12

| | |
|---|-----|
| Vaname Shrimp Pond Cultivation at the Iron Sand Post-Mine Land and its Impact on the Environment in Grabag District, Purworejo Regency, Indonesia | 175 |
| <i>Rahma Hayati and Yuli Agus Setyawan</i> | |
| Introduction | 175 |
| Exploration, Production and Iron Sand Post-Mining Phase in Grabag District and the Surrounding Areas | 177 |
| Shrimp Pond Cultivation; One of the Activities in the Sand Iron Post-Mining Land | 178 |
| Environmental Impacts of Shrimp Pond Cultivation in the Iron Sand Post-Mining Land | 182 |
| Environmental Damage | 182 |
| Coastal Area Conservation Efforts | 184 |
| Conclusion | 185 |

CHAPTER 13

| | |
|--|-----|
| Social Welfare at the Small Settlement Centres in the Northern Corridor of Selangor, Malaysia <i>Yazid Saleh, Mohmadisa Hashim, Hanifah Mahat, Nasir Nayan, Saiyidatina Balkhis Norkhaidi and Mohamad Khairul Anuar Ghazali</i> | 187 |
| Introduction | 187 |
| Social Welfare at the Small Settlement Centre Northern Corridor of Selangor | 188 |
| Social Welfare at the Small Settlement Centres | 191 |
| Neighbourhood Centre Social Welfare Level | 194 |
| Neighbourhood Relationships in the Neighbourhood Centre | 195 |
| Security and Social Problems in Neighbourhood Area | 197 |
| Accessibility to the Provision of Neighbourhood Social Facilities | 198 |
| Provision of Basic Amenities in Neighbourhood Centre | 200 |
| Conclusion | 201 |
| Acknowledgement | 202 |

CHAPTER 14

| | |
|--|-----|
| Heritage City Sustainability Measurement: A Literature Review <i>Mohamad Khairul Anuar Ghazali, Yazid Saleh and Hanifah Mahat</i> | 203 |
| Introduction | 203 |
| Sustainable Heritage City Development Issues | 204 |
| Issues of Sustainability of Heritage Cities in Malaysia | 206 |
| Metric Synthesis of Urban Sustainability Indicators | 207 |
| Global Ranking | 207 |
| Regional Level | 209 |
| Malaysian Level | 210 |
| Heritage City Sustainability Domain in Malaysia | 212 |
| Conclusion | 214 |
| Acknowledgement | 215 |

CHAPTER 15

| | |
|--|-----|
| Preservation of Local Wisdom of <i>Iriban</i> Tradition in Semarang Regency Watershed Area, Indonesia <i>Thriwaty Arsal</i> | 217 |
| Introduction | 217 |
| The Demographic and Geographic Dynamics of the Lerep Tourism Village | 220 |
| Form of Local Wisdom of Watershed Communities | 238 |
| Preservation of Local Wisdom | 232 |
| Conclusion | 236 |

CHAPTER 16

| | |
|---|-----|
| Green Technology Utilization and Management among Secondary School Students in Malaysia <i>Hanifah Mahat, Nur Syafini Yaacob, Saiyidatina Balkhis Norkhaidi, Mohmadisa Hashim, Nasir Nayan and Yazid Saleh</i> | 237 |
| Introduction | 237 |
| The Concept of Green Technology | 238 |
| Green Technology Management and Utilization | 239 |
| Green Technology Utilization and Management among Secondary School Students | 241 |
| Conclusion | 249 |

CHAPTER 17

| | |
|---|-----|
| Multicultural Identity and Adjustment by Students in Malaysian Public University <i>Samsudin Suhaili and Nur Nadia Lukmanulhakim</i> | 251 |
| Introduction | 251 |
| Multicultural Identity and Adjustment Background | 252 |
| Demography and Multicultural Identity | 254 |
| Conclusion | 258 |

CHAPTER 18

| | |
|--|-----|
| Environmental Sustainable Numeracy in Malaysia <i>Saiyidatina Balkhis Norkhaidi, Hanifah Mahat, Mohmadisa Hashim, Nasir Nayan and Yazid Saleh</i> | 259 |
| Introduction | 259 |
| Numeracy and Use in Daily Life | 261 |
| Thought of Numeracy and Environment | 264 |
| Environmentally Sustainable Numeracy Application | 267 |
| | |
| <i>Bibliography</i> | 273 |
| <i>List of Contributors</i> | 315 |
| <i>Index</i> | 319 |

List of Tables

| | | |
|------------|---|----|
| Table 2.1 | Data of discharge and KRS of Garang watershed in 1998-2007 | 16 |
| Table 2.2 | The land use of the Garang watershed as the result of image interpretation from Landsat 7 ETM + Satellite Imagery in 2002 and Landsat 8 OLI-TIRS 2015 | 19 |
| Table 2.3 | The carrying capacity of a watershed in terms of area used | 20 |
| Table 3.1 | DOE's WQI classification | 35 |
| Table 3.2 | Water classification and uses | 35 |
| Table 3.3 | Major flood events from 2004 to 2009 | 38 |
| Table 3.4 | List of flood sampling stations | 42 |
| Table 3.5 | The formula for calculating the SI value of six water parameters | 43 |
| Table 3.6 | Classification of water quality and its uses | 44 |
| Table 3.7 | Concentration values of DO, pH, BOD, COD, NH ₃ N and SS | 49 |
| Table 3.8 | The concentration values of turbidity, NO ₃ , Fe, Mg, Ca and Cu | 50 |
| Table 3.9 | Value of bacterial content of E.coli | 51 |
| Table 3.10 | SI, WQI value, grade and flood water quality status | 51 |
| Table 4.1 | Rainfall stations in the KRB | 65 |
| Table 4.2 | Annual rainfall data analysis of stations in the KRB, 1961-2006 | 67 |
| Table 4.3 | Annual rainfall in the KRB and its relation to El Niño and La Niña events | 70 |
| Table 4.4 | Descriptive analysis of monthly rainfall in the KRB, 1961–2006 | 73 |
| Table 4.5 | Average long-term rainfall statistics of the KRB, 1961–2006 | 74 |
| Table 4.6 | Long-term statistics of point rainfall by season in the KRB | 78 |

| | | |
|------------|---|-----|
| Table 4.7 | Mann–Kendall test for rainfall trends in the KRB, 1961–2006 | 79 |
| Table 5.1 | Sampling station in the downstream areas ... | 83 |
| Table 6.1 | Location and elevation by Global Proposition System (GPS) | 93 |
| Table 6.2 | Description based on parameters, unit and methodology for this research | 94 |
| Table 6.3 | Water quality based on LAWA classification (1998) | 94 |
| Table 6.4 | Malaysian National Water Quality Standard (NWQS) | 95 |
| Table 6.5 | Water quality result for 11 sites based on the in-situ parameter | 99 |
| Table 6.6 | Result of water quality for 11 sites sampling station (Main River, Tributaries and Mine) based on sediment and nutrient parameter | 102 |
| Table 7.1 | Changes in land utilization in Mijen, Gunungpati, and Ngaliyan sub-districts | 109 |
| Table 7.2 | Changes in total ecological footprint in 2002 and 2016 | 110 |
| Table 7.3 | Changes in bio-capacity in 2002 and 2016 | 111 |
| Table 7.4 | Changes in environmental carrying capacity in 2002 and 2016 | 112 |
| Table 8.1 | Land cover and land use classification at the 100,000 scale | 118 |
| Table 8.2 | The territorial division of Garang watershed | 120 |
| Table 8.3 | The land use of Garang watershed in 2001, 2010, 2016, and 2019 | 124 |
| Table 10.1 | Priority restored watersheds in Central Java Province | 145 |
| Table 10.2 | Rivers in Tuntang watershed Semarang Regency | 149 |
| Table 10.3 | Alignment of Tuntang watershed administrative areas | 150 |
| Table 10.4 | Land utilization in Tuntang watershed in Semarang Regency area | 150 |

| | | |
|------------|--|-----|
| Table 10.5 | Number of population growth and density in Tuntang watershed Semarang Regency | 152 |
| Table 10.6 | Age and gender of population in Tuntang watershed Semarang Regency | 155 |
| Table 10.7 | Job structure of population in Tuntang watershed of Semarang Regency administrative area | 156 |
| Table 10.8 | Number of large industries in Tuntang watershed Semarang Regency | 157 |
| Table 10.9 | Demographic events in Tuntang watershed Semarang Regency administrative area | 158 |
| Table 11.1 | Pb metal content in Juwana watershed 2009 | 167 |
| Table 13.1 | Current population distribution by population in Hulu Selangor District (2010) | 193 |
| Table 13.2 | Demographic of respondents | 194 |
| Table 13.3 | The impressions of neighbourhood relations in neighbourhood centres | 196 |
| Table 13.4 | The impressions of the security and social problems in the residential neighbourhood | 198 |
| Table 13.5 | The level of satisfaction of heads of household with the accessibility on the social amenities service | 199 |
| Table 13.6 | The level of satisfaction of the head of the household on the provision of the basic facilities of the neighbourhood | 201 |
| Table 14.1 | Global sustainability level at global level ... | 208 |
| Table 14.2 | Urban sustainability indicators at regional level | 210 |
| Table 14.3 | Urban sustainability indicators at the Malaysian level | 212 |
| Table 15.1 | Distribution of population by education level | 225 |
| Table 15.2 | Area and land use (ha) | 225 |
| Table 15.3 | Supporting parties for the preservation of the <i>Iriban</i> tradition | 235 |
| Table 16.1 | Reliability of the study instrument | 242 |
| Table 16.2 | Level of green technology knowledge among secondary school students | 244 |

| | | |
|------------|---|-----|
| Table 16.3 | Level of green technology utilization among secondary school students | 245 |
| Table 16.4 | Level of green technology management among secondary school students | 246 |
| Table 16.5 | Correlation coefficient values | 248 |
| Table 16.6 | Relationship between the variables of knowledge, utilization, and management of green technology among secondary school students | 249 |
| Table 17.1 | Questions according to each multicultural category | 253 |
| Table 17.2 | Students' demography by sex, ethnic and religion | 255 |
| Table 17.3 | Overall mean score and mean score by question | 256 |
| Table 17.4 | Mean interpretation scale | 257 |
| Table 17.5 | Overall mean score and level according to category | 257 |
| Table 18.1 | Importance and use of numeracy in daily life | 263 |
| Table 18.2 | Summary of application design implications, data collection methods and indicators/ components studied in environmental numerical studies | 267 |

List of Figures

| | | |
|-------------|---|----|
| Figure 2.1 | Map of the Garang watershed in Semarang City | 13 |
| Figure 2.2 | Graph of change in land use and watershed carrying capacity | 21 |
| Figure 3.1 | Flooding vulnerable areas in Peninsular Malaysia | 36 |
| Figure 3.2 | Flooding vulnerable areas in Sabah and Sarawak | 37 |
| Figure 3.3 | Kuala Krai District, Kelantan | 45 |
| Figure 3.4 | River system and flood coverage in 2014 | 46 |
| Figure 3.5 | Selected flood evacuation centres location | 47 |
| Figure 4.1 | Location of KRB in the state of Perak and locations of rainfall stations | 64 |
| Figure 4.2 | Annual rainfall trend in the KRB, 1961–2006 | 68 |
| Figure 4.3 | Cumulative rainfall for each rainfall station in the KRB, 1961–2006 | 68 |
| Figure 4.4 | Areal rainfall based on 5-year average moving rainfall in the KRB, 1961–2006 | 69 |
| Figure 4.5 | Annual rainfall in the KRB, 1961–1992 | 69 |
| Figure 4.6 | Annual rainfall in the KRB, 1993–2006 | 70 |
| Figure 4.7 | Average monthly rainfall in the KRB, 1961–2006 | 72 |
| Figure 4.8 | Total rainfall during NEM, 1961–2006 | 75 |
| Figure 4.9 | Total rainfall during SWM, 1961–2006 | 76 |
| Figure 4.10 | Comparison of total rainfall during NEM and SWM, 1961–2006 | 76 |
| Figure 4.11 | Total rainfall during the monsoon transition (April), 1961–2006 | 77 |
| Figure 4.12 | Total rainfall during the monsoon transition (October), 1961–2006 | 78 |
| Figure 5.1 | Sampling stations | 83 |
| Figure 5.2 | Average monthly rainfall at the Bernam River area in Tanjung Malim from 2000-2017 | 85 |

| | | |
|-------------|---|-----|
| Figure 5.3 | Variations in SSC sampling during storm events | 87 |
| Figure 5.4 | Cumulative sediment loading in Bernam River | 88 |
| Figure 6.1 | Sampling site location and land use in the catchment area | 91 |
| Figure 6.2 | A number of mines in the lower part of the Slim River catchment | 92 |
| Figure 6.3 | Location of sampling sites through the transect | 92 |
| Figure 6.4 | Rainfall in the Slim River catchment at two rainfall stations in the catchment area (data from 2002-2010) | 96 |
| Figure 7.1 | Changes in ecological footprint in 2002-2016 | 110 |
| Figure 7.2 | Changes in bio-capacity in 2002-2016 | 110 |
| Figure 7.3 | Changes in environmental carrying capacity (ECC) in 2002 and 2016 | 113 |
| Figure 7.4 | Changes in land utilization in Mijen sub-district | 114 |
| Figure 8.1 | The Garang watershed map | 119 |
| Figure 8.2 | Garang watershed land use map in 2001 | 121 |
| Figure 8.3 | Garang watershed land use map in 2010 | 122 |
| Figure 8.4 | Garang watershed land use map in 2016 | 123 |
| Figure 8.5 | Garang watershed land use map in 2019 | 124 |
| Figure 8.6 | The settlement/build up area trend line in Garang watershed | 125 |
| Figure 8.7 | The forest and mixed garden trend line in Garang watershed | 126 |
| Figure 8.8 | The agricultural area trend line in Garang watershed | 126 |
| Figure 9.1 | The phase of urbanization experience in Malaysia | 137 |
| Figure 10.1 | Tuntang watershed map | 148 |
| Figure 10.2 | Population dynamics | 151 |
| Figure 10.3 | Population density map of Tuntang watershed Semarang Regency | 153 |

| | | |
|--------------|--|-----|
| Figure 10.4 | Population growth map of Tuntang watershed Semarang Regency | 154 |
| Figure 11.1 | Causes of soil degradation | 163 |
| Figure 11.2 | Juwana watershed | 165 |
| Figure 11.3 | Use of animal manure as organic fertilizer and utilization water plants as a reduction of chemical fertilizer residues | 173 |
| Figure 12.1 | Distribution of potential iron sand deposits in Grabag District and surrounding areas | 176 |
| Figure 12.2 | Shrimp pond cultivation with mulch plastic base | 179 |
| Figure 12.3 | (a) pH meter to measure the acidity of pond water (b) Salinometer to measure the level of water salinity | 180 |
| Figure 12.4 | (a) Seci to measure the level of pond water brightness (b) Anco to observe pond shrimp feeding | 181 |
| Figure 12.5 | Waterwheels for intensive pond cultivation | 181 |
| Figure 12.6 | Land clearing for ponds | 182 |
| Figure 12.7 | The broken pond due to the beach shore was hit by the waves | 183 |
| Figure 12.8 | Stunted rice growth | 183 |
| Figure 12.9 | Ketawang Indah beach | 184 |
| Figure 12.10 | Abrasion-retaining sandbags | 185 |
| Figure 13.1 | Klang-Langat Valley Metropolitan Area, Malaysia | 192 |
| Figure 13.2 | Locations of small settlement centres along the Northern Corridor of Selangor in the Hulu Selangor District, Malaysia | 192 |
| Figure 15.1 | Embung Sebligo as a nature tourism destination | 221 |
| Figure 15.2 | Lerep Art Village as a cultural tourism destination | 222 |
| Figure 15.3 | Map of Lerep Village | 226 |

| | | |
|-------------|---|-----|
| Figure 15.4 | Water supply to residents' houses from the water source of the Iriban | 227 |
| Figure 15.5 | Springs used as a place for Iriban | 228 |
| Figure 15.6 | Iriban tradition in Lerep Tourism Village | 229 |
| Figure 15.7 | Chicken roasting process in Iriban tradition | 230 |
| Figure 15.8 | One of the residents eating urab/gudangan in Iriban | 230 |
| Figure 16.1 | Elements of the Three-Dimensional Model | 241 |
| Figure 18.1 | Mathematics vs numeracy | 261 |
| Figure 18.2 | Quantitative Reasoning Cycle: Q.A., Q.L., Q.I. and Q.M. | 265 |
| Figure 18.3 | SCT prediction versus actual impact of science literacy and numeracy on climate change risk perceptions | 266 |

Preface

Originally this book chapters are coming from the paper to be presented at the International Drainage Basin Dynamics Seminar, jointly organized by the Department of Geography, Faculty of Social Sciences, Universitas Negeri Semarang (UNNES), Indonesia and the Department of Geography and Environment, Faculty of Human Sciences, Universiti Pendidikan Sultan Idris (UPSI), Malaysia planned on March 30 and 31, 2020. However, due to the Covid-19 pandemic Southeast Asia region and globally, this seminar was cancelled.

Given the ongoing collaboration between UNNES and UPSI, we as book editors have taken proactive steps to publish this book. This book consists of 18 chapters which cover a wide range of issues from the perspective of the physical and human geography in the river basin area. Generally, the river basin is a physical space involving four main spherical reactions on earth, namely atmosphere, hydrosphere, lithosphere, and biosphere. These four spheres respond and relate to each other, which eventually raises a variety of issues in either a positive or negative way. Till today, humans, as part of the biosphere component, has played a significant role in changing the other components of the river basin.

This book is designed to help readers see an issue occurs in a river basin from a physical and human geographical perspective. This book is not only for geographers but also for other social scientists and those interested in fields related to spatial geography. We would like to express our sincere thanks to the authors who contributed to the chapter in this book. Special thanks to UNNES and UPSI for helping to make this book a success. Thank you Penerbit Universiti Tun Hussein Onn (Penerbit UTHM) for the efforts to publish this book within the promised timeframe.

Mohmadisa Hashim
Dewi Liesnoor Setyowati
Nasir Nayan

CHAPTER

1

Drainage Basin Dynamics: An Overview

Mohmadisa Hashim, Dewi Liesnoor Setyowati and Nasir Nayan

Nature supplies humans with a variety of essential nutrients in life, such as water and air, which is essential to support life not only to humans but all living things. And the focus of this book life in the river basin. The river basin is also known as a water catchment area. Rainwater drop within the basin will be transported to the river and then utilized for human consumption. The rapid development has pressured the river basin dynamics leading to natural processes interruption, like transporting highland water to nearby rivers. This situation leads to phenomena such as landslides or flash floods in this river basin. This book will try to highlight the studies related to river basins, especially in Malaysia and Indonesia.

In chapter two, the writer discusses the phenomenon of flood disaster as the number one natural disaster in Indonesia. One of the areas prone to flood is Semarang City. Semarang is a city that is often crossed by rivers, one of which is Garang River, which divides the western part of Semarang. This chapter intend (1) determine the dynamics of Garang watershed, (2) analyse the carrying capacity of Garang watershed, and (3) investigate the efforts to preserve Garang watershed. The main concern in the Garang watershed area is the land changes in the upstream watershed, which is hydrologically a catchment area. The damage has particularly occurred in areas that are supposed to be protected areas turned into an annual crop cultivation area. The level of vegetation density in the buffer zone in the upper watershed is still relatively good (more than 200 trees per hectare). The land suitability index in the upper part of Garang watershed shows poor classification, with Land Suitability Index (IKPL) of 60 percent, meaning that many land uses are not aligned with the functions of the land. With Garang watershed drainage pattern, the characteristics of land use, and climatic conditions contribute to the high runoff of water, which therefore causing a risk of flooding. Efforts to conserve the river need to be supported by several parties, including

CHAPTER

2

Water Management Analysis and Carrying Capacity for Watersheds Conservation in Garang, Semarang, Indonesia

Dewi Liesnoor Setyowati, Sucihatningsih DPW, Suroso and Muhammad Amin

Introduction

Indonesia is a disaster-prone country. Based on the data from disaster events from 1900 to 2010, there were successive disasters as follows: flood events around 34 percent, earthquakes around 25 percent, volcanic eruptions around 12 percent, landslides around 11 percent, epidemics around 9 percent, storms around 3 percent, drought, forest fires, and tsunamis each around 2 percent (Ginting & Putuhena, 2014). The threat of disaster is even greater if there is an uncertain climate change. Broadly, a disaster is an event or series of events that threaten and disrupt people's lives and livelihoods caused by both natural and/or non-natural factors as well as human factors resulting in fatalities, environmental damage, property losses, and psychological impacts (BNPB, 2007). The phenomenon of flood disaster is the number one disaster in Indonesia. One area that is prone to flooding is in the city of Semarang. Every rainy season, the city of Semarang often experiences floods caused by several factors, including increased discharge, uncontrolled river flow, river narrowing due to sedimentation process, and environmental damage in the upstream and downstream areas of the river (Findayani, 2018). As a result, many people died or were killed, psychological trauma, loss of their homes, and even crop failure. Floods were recorded in Semarang City in 1973, 1988, 1990, and 1993 in the Garang River which claimed lives (Reseda, 2012). Kali Garang, according to its name, becomes fierce when water flow increases which causes floods, even flash floods or major floods. The major floods in Kali Garang had occurred several times, including in 1963, 1990, 2000, 2002, and 2008 (Suhandini, 2012). The phenomenon of the massive flood on January 26, 1990, was in the form of the overflow of Kali Garang and the break of the embankment in the West Flood Canal. The location of the biggest flood occurred at the confluence of the Garang and Kreo rivers to the Simongan dam. The impact of the massive flood claimed 47 lives, 25 houses were destroyed,

CHAPTER

3

Assessment of Flood Water Quality in Kuala Krai District, Kelantan, Malaysia

*Nasir Nayan, Mohmadisa Hashim, Yazid Saleh,
Hanifah Mahat and Koh Liew See*

Introduction

Disasters are natural or human-made events that can affect humans or the environment. Among the effects of disasters is the potential for adverse effects on human life, property, livelihoods, or industries and often result in permanent changes in human society, ecosystems, and the environment (Quarantelli, 1998). However, the effects of floods can be minimized through disaster management before and after the disaster (Soetanto & Proverbs, 2004). Disaster usually affects a country and is influenced by human activities in the country's development. Therefore, every country should not have to have systematic disaster management to reduce the impact of disasters in their respective countries. Also, disaster management can only be adapted to the actual situation, economic, social, cultural, institutional, technological, technical, environmental, and legal conditions of the country (Kaklauskas, Amaratunga & Haigh, 2009). The most frequent disasters in Malaysia are the floods, especially that hit the East Coast of Peninsular Malaysia every year in the states of Kelantan, Terengganu, Pahang, and Johor. These floods often occur from November to March because of the northeast monsoon winds that bring with it heavy rainfall. Floods in Malaysia are not only caused by natural factors but also by human factors (Chan, 1995). Flood phenomena are disasters when their incidents lead to serious dangers and risks such as death, destruction of property, disruption of necessary facilities and giving psychological or traumatic effects to flood victims (Tuan Pah Rokiah, Baharum, & Hamidi, 2014). However, flood events often have a devastating effect on residents, especially those living in high-risk riverside areas. The key problem faced by flood victims in terms of a source of water supply is that it is difficult to get a water supply for domestic activities due to disruption in the water supply system and clean water sources contaminated by floodwater. While clean water plays a vital role as a source of water for domestic activities in times

CHAPTER

4

Long-term Rainfall Variability and Trend in the Kinta River Basin, Perak, Malaysia

Mohmadisa Hashim, Wan Ruslan Ismail, Nasir Nayan, Hanifah Mahat and Yazid Saleh

Introduction

Rainfall is one of the most common forms of precipitation in the tropics. In addition to rainfall, other forms of precipitation include snow, dew, and hail. Rainfall is also a process that occurs during the hydrological cycle. The hydrological cycle is a dynamic process, occurring in the physical environment and involving the continuous movement of water in the atmospheric space (upper space) as well as the biosphere, hydrosphere, and lithosphere (on the surface and in groundwater). The movement of water involves various components of nature, such as air, plants, ground surfaces, rivers, lakes, oceans, and areas underground (Abdullah, 1999). In the meantime, certain processes respond to one another, namely condensation, precipitation, evaporation, surface runoff, infiltration, and evaporation. This natural process has no starting or endpoint, as it always happens or rotates and forms a cycle driven by the energy from the sun. For more understanding, the hydrological cycle begins with a process of evaporation, which is the process of transferring water and water vapor from the surface of the sea, oceans, lakes, rivers, and plants to the atmosphere. Evaporated water vapor condenses in the atmosphere, especially in clouds, and this is known as a condensation process. In addition to evaporation, the process of evapotranspiration, especially from green areas or plants, also adds water vapor to the atmosphere.

Next, condensation occurs because of chemical reactions or a condensation process that forms beads of water embedded in the clouds and results in precipitation, either in a solid (snow) or liquid (rain) form. The downpour precipitation will go through a process of bypass, infiltration, and water runoff on the surface of the earth. The bypass process refers to downpour precipitation that does not reach the surface of the earth but first passes by vegetation or forest, where some water is stored. Besides, some of the downpour precipitation will directly reach the surface of the earth, forming an infiltration process and then

CHAPTER

5

Variations in Suspended Sediment Concentration during Storm Events in Bernam Sub Catchment, Perak Malaysia

Sumayyah Aimi Mohd Najib, Syazwani Aliah and Husna Nabilah Hamidon

Introduction

Storm events cause mobilisation and transport of materials such as dissolved nutrients and suspended sediments into streams and rivers. Describing and quantifying hydrological and biogeochemical responses to storm events contribute to the understanding of underlying solute and particulate export to the downstream ecosystems. The coupling between hydrological and biogeochemical components of stream responses to storms is reflected in the relationship between concentration and discharge during a storm event (Godsey *et al.*, 2009; Lloyd *et al.*, 2016). The concentration-discharge relationship (C - Q) does reveal hydro chemical processes and thus infers the origin and fate of materials transported (Bowes *et al.*, 2015; Lawler *et al.*, 2006). Surface soil loss due to erosion from agricultural land threatens soil quality and agricultural productivity (Liu *et al.*, 2018). Once the eroded soils and contaminants get into the water surface, they are transported and then deposited as sediment, thus affecting the freshwater quality and aquatic habitats (Collins *et al.*, 2017). Therefore, minimising soil erosion and reducing sediment loading are critical to maintain a sustainable ecosystem. The step to quantify the sediment sources is fundamental in developing a soil erosion mitigation plan and reducing sediment loading.

Quantifying the uncertainties associated with sediment source is one of the challenges in sediment source apportionment. Some of the sediments transported in the falling limb during large storms are deposited in the channel. The deposited sediments are the source for the next event on the rising limb and hysteresis. Large storm events cause erosion of sediments from the construction sites, causing the next event to have lower sediment load and sediment concentration. Since most of the sediments in the disturbed basin are delivered on the recessional limb, the reduced number of sediments from the previous storm events lead to lesser sediments available on the recessional limb and clockwise

CHAPTER

6

Physico-Chemical Parameters and Water Quality of Slim River, Perak, Malaysia

Wan Ruslan Ismail, Mohamad Adam Omar, Siti Fadzilatulhusni Mohd Sani, Noraini Misnan and Sumayyah Aimi Mohd Najib

Introduction

In Malaysia, there is a lots of water resource because of wide distribution of watershed in natural tropical forest resource. The total forest in peninsular Malaysia is 5.89 million hectare (Forestry Department of Peninsular Malaysia, 2009). While the average rainfall in Malaysia about 2030 mm per year (Tew, 1999). Forest plays an important role in formation and distribution of water resource of the country. Therefore, their protection, sustainable use and restoration are essential for the sustainability of water resource management. Changing forest to agriculture area has given some negative impact to ecosystem environment. The negative impact of deforestation on aquatic organism has been shown elsewhere. As a stretch of forest is cleared, surface runoff has been increased. So, total suspended solid in water also increased (Mohamad Shuhaimi *et al.*, 2006). The agriculture sector in Malaysia has been growing rapidly over the years. Due to the excellent natural conditions in Malaysia such as the level of humidity, the tropical weather, the rich soil, and the production rate of the agriculture industries in Malaysia nowadays is considered as one of the largest amongst the Asia regions. In agriculture regions, fertiliser application is the main source of adjective for both phosphorus and nitrogen into the streams. Other potential sources include urban and industrial runoff, pesticides, effluent from feedlots and wastewater treatment plants, and weathering of rock material, while nitrogen may also be augmented by fixation from the atmosphere. The amount of nutrient released depend on factors such as the type, amount, method and timing of nutrient application, the susceptibility of the soil to erosion and the rates of chemical and biological transformation (Turner & Rabalais, 2003).

Water quality in river estuaries, lake and reservoirs depends on the quantity and quality of inflows from upstream catchment and cycling within the water bodies. In the case of estuaries, exchange with the ocean.

CHAPTER

7

Land Conversion and Decrease in Environmental Carrying Capacity of Kreo Sub-Watershed in Semarang City, Indonesia

Hariyanto, Erni Suharini and Wahyu Setyaningsih

Introduction

The land is part of the environment as a natural resource that plays a vital role in various human interests. The land is used as housing, agriculture, farm, mining, roads, and social and economic facilities building, and so on. The problem is that the land area is not increasing, whereas land demand will continue to increase. Consequently, increasingly high competition in land utilization has occurred and less productive land will be converted into other utilizations such as housing, industry, infrastructure, and so on (Dewi & Rudiarto, 2013). Data from Agricultural Census in 2003 shows that from 2000 to 2002 rice field land conversion in Indonesia reaches 187.7 thousand ha per year, whereas new rice field development is only 46.4 thousand ha per year (Irawan, 2005). It means that there is a decrease in the rice field area of 141.3 thousand ha per year. The worst yet come since the rice field conversion in Java Island is still massively and accumulatively increasing, whereas soil fertility in Java Island is four-time of soil outside Java Island (Sutomo, 2004). Head of the Agricultural Department of Semarang City, Rusdiana (2014) states that agricultural area in Semarang region is decreasing every year due to land conversion. The rice field of agricultural land area in the region decreases by 5 - 10 percent. Based on data from the Agricultural Department of Semarang City, the rice field area left in Semarang City is only 3,700 ha spread in Mijen sub-district area, Gunungpati, which is a Kreo sub-watershed. He explains that the decrease is related to many new lands clearing for housing and industry that is also occurred in other areas (Office of Agriculture, Semarang, 2016). The agricultural land conversion has a direct implication on the decrease in food production in Semarang City and indirectly on the decrease in environmental quality or environmental carrying capacity.

Agricultural land conversion will influence resource production, especially agricultural products. Consequently, it will reduce the food

CHAPTER

8

Trend of Land Use Change at the Garang Watershed, Central Java Province from 2001 - 2019

Tjaturahono Budi Sanjoto and Saryono

Introduction

The Garang watershed is administratively located in three regencies and cities. The upstream part of the watershed is located in Semarang and Kendal districts, while the middle and downstream parts of the Garang watershed are in the Semarang City. The role of the Garang watershed is very important and strategic because it passes through the city of Semarang as a large city that has quite high business activity. Garang River is a source of clean water for the citizens of Semarang City. Nevertheless, Garang River is also often becoming the cause of flooding in the city of Semarang. Therefore, to maintain the function of Garang River as a water resources supplier and minimize the causes of flooding, an integrated and synergy management system is needed. In practice, watershed management and application of land use that are not carried out in an integrated and unplanned way, can increase the flood discharge, and affect the erosion as well as sedimentation processes. When there is rain with high intensity while the watershed system has been damaged, it causes the watershed response to be reduced so that it becomes the cause of flooding and the silting of rivers due to sedimentation. Sedimentation, besides causing river siltation, can also cause siltation in coastal estuaries and shoreline changes. Based on the results of a study conducted by the Regional Development Regency of Semarang in 2006, there was a change in the coastline caused by the high sediment supply originating from the West Flood Canal which is a channel of the Garang River (Ginting, 2009).

The Garang watershed is one of the watersheds whose carrying capacity has been restored based on the Central Java Regional Regulation No.15 of 2014 concerning watershed management. Garang watershed is one of the priority watersheds in the working area of the Jaliun Pemali Watershed Management Centre. Land use change in the Garang watershed is a major problem especially for areas that are prioritized as

CHAPTER

9

A Review of the Impact of Urban Green Park on Urban Ecosystems

*Madeline Henry Luyan, Nasir Nayan and
Mohmadisa Hashim*

Introduction

Population changes have increased economic activity in urban areas. This increase in economic activity not only offers employment opportunities but also increases the demand for housing, social amenities, and also increases the need for vehicles and highways (Haryati & Sharifah Meryam, 2010; Haryati & Nurasyikin, 2011). Data by the Malaysian Automotive Association (MAA) showing the increasing number of new vehicle registration in 2019 compared to 2018 by 17,080 units or 3.2 percent from 533, 099 units in 2018 makes 550,179 units in 2019 (Malaysian Automotive Association, 2020). The volume increases the emission of pollutants in the air. Urbanization also indirectly alters the physical properties of the earth's surface. The construction of sizeable buildings, roads and parking areas improve the city's ability to store heat, dissipate water and influence wind movement. It will release the stored heat during the day into the air at night, causing temperatures in the city to rise. In Malaysia, the main issue always associated with urban life impedes achieving an excellent quality of life. The quality of life that comes with comfort divided into four factors, namely temperature, lighting, noise and even air quality. Studies conducted by several domestic and foreign researchers have shown that environmental quality problems are increasing with increasing population and increasing use of urban transport (Rofifei *et al.*, 2016). These human activities have a direct or indirect effect on the surrounding ecosystem (Roland *et al.*, 2016) several socioeconomic, demographic and geographic processes may render the access to GS challenging. Moreover, it is often critical to know what type of GS service to develop at a specific place. Also, measurements accuracy issues could be critical for planning and decision making. As an example of what could happen in many other cities of different sizes, we modeled and compared the access to GS, including several of their specific functions, in the Census Metropolitan Areas (CMA. The global

CHAPTER

10

Population Dynamics of Tuntang Watershed Semarang Regency, Indonesia

Puji Hardati

condition and biophysics that shape it as well as the dynamics of its population that use and manage it. There are big rivers in the world with varied watershed. There are at least ten big rivers and their watersheds, namely: Amazon River with a watershed area of 7050 (x103 km) and length of 6200 km; Congo River with a watershed area of 3690 (x103 km²) and length of 4200 km; Mississippi River with a watershed area of 3221 (x103 km²) and length of 6020 km, La Plata River with a watershed area of 3100 (x103 km²) and length of 4700 km; Obi River with a watershed area of 2950 (x103 km²) and length of 5200 km; Nile River with a watershed area of 2870 (x 103 km²) and length of 5600 km; Yangtze River with a watershed area of 1780 (x103 km²) and length of 5200 km; Brahmaputra River with a watershed area of 1730 (x103 km²) and length of 3000 km; Volga River with a watershed area of 1400 (x103 km²) and length of 3600 km; and St. Laurant River with a watershed area of 1250 (x103 km²) and length of 3800 km (No Name, nd).

A watershed is a natural area unit that provides production benefits and water supply through a stream, groundwater, or springs to fulfil various life necessities both for humans and flora or fauna (Paimin *et al.*, 2012). It is an integrated water system and ecosystem where interaction between biotic elements in the form of land cover vegetation and abiotic elements of land and climate occurs. It is a land area that integrates with the river and its tributaries and serves as a reservoir and flows water from rainfall to a lake or ocean naturally. Its boundary on land is a topographical separator, whereas at sea until the water's areas are still influenced by land activities (Anonim, 2015a). A watershed is a land that water flows across or under on its way to a stream, river, or lake. The landscape is made up of many interconnected basins or watersheds. Within each watershed, all water runs to the lowest point such as a stream, river, or lake. On its way, water travels over the surface and across farms, fields, forest lands, suburban lawns, and city streets; or it seeps into the

CHAPTER

11

Sustainable Agriculture Management in the Juwana Sub-Watershed, Indonesia

Eva Banowati, Aprillia Findayani and Adhitya Prasetya Adji

Introduction

Indonesia is an agrarian country, approximately 28.79 percent of the population do farm activities as their main livelihood (Sakernas, 2018). **This is supported by the natural conditions and resources. The location of Indonesia which is in the ring of volcanoes provides its advantages in the form of fertile soil because of volcanic activity produced by approximately 160 active volcanoes. Agriculture is a type of production activity based on the growth process of flora and fauna, humans take a role in the process of cultivating plants and animals as well as regulating in meeting their needs (Banowati & Sriyanto, 2013). In its implementation, this activity requires humans/communities to take on various agricultural businesses to produce effective and efficient products. Agricultural business is a biological industry that utilizes materials and biological processes to obtain appropriate profits for the perpetrators which are packaged in various subsistence ranging from pre-production, production, harvest, post-harvest subsystems, distribution, and marketing. An agricultural business system can be said to be environmentally sound if in its management it applies advanced technology that is environmentally friendly or does not cause negative externalities to the environment both the biophysical environment and the economic social environment at the micro and macro levels (Adnyana, 2016). Many factors affect agricultural production such as soil conditions, land area, seed quality, fertilizer, and other physical and natural factors. The relationship of each of these factors will determine the effectiveness of an input on the acquisition of production and the size of the negative impact caused by the environment. So, it is necessary to understand a basis of an integrated agriculture pattern that prioritizes the use of natural resources as much as possible before deciding on the use fossil energy as expressed by El-Titi and Landes (1990).**

CHAPTER

12

Vaname Shrimp Pond Cultivation at the Iron Sand Post-Mine Land and its Impact on the Environment in Grabag District, Purworejo Regency, Indonesia

Rahma Hayati and Yuli Agus Setyawan

Introduction

Iron sand is a particle that contains iron (magnetite), formed due to the process of destruction of rocks from intermediate to bases on andesitic to basaltic. This type of rock comes from volcanoes. The existence of volcanic eruption activity makes the iron sand material transported to and accumulated on the beach, so iron sand is found along the coast. Sea wave energy will sort out and accumulate these deposits into iron sand deposits that have economic value. In Indonesia, the potential of iron sand is deposited in the form of dunes along the coastal plain, including the west coast of Sumatra, the south coast of Java and Bali, the beaches of Sulawesi, East Nusa Tenggara, Maluku, and the north coast of Papua (Hilman *et al.*, 2014). The spread of iron sand deposits with high concentrations is found almost along the South Coast of Java Island. One area that has iron sand deposits is in Grabag District, Purworejo, Central Java. Iron sand concentration in the area reaches up to 54.17 percent (Bronto, 2007). Potential resources of iron sand deposits in Grabag sub-district and its surroundings are located along the South Coast in the north-northwest and southwest (Figure 12.1). The sediment is covered by alluvium which gradually smoothed with increasing depth. Iron sand deposits in Grabag sub-district and its surroundings have a thickness of up to ± 10 m, found at a depth of ± 20 m and ± 60 m below the surface, with a total area of 26,329,188 m². The main minerals contained in the iron sand deposit are magnetite ($\text{Fe}_3\text{O}_4 / \text{FeO} \cdot \text{Fe}_2\text{O}_3$), hematite (Fe_2O_3), and ilmenite ($\text{FeTiO}_3 / \text{FeO} \cdot \text{TiO}_2$), and associated minerals pyrrhotite (FeSn), pyrite (FeS_2), marcasite (FeS_2), chalcopyrite (CuFeS_2), chromite ($\text{FeO} \cdot \text{Cr}_2\text{O}_3$), almandite [$\text{Fe}_3\text{Al}_2(\text{SiO}_4)_3$], andradite [$\text{Ca}_3\text{Fe}_2(\text{SiO}_4)_3$], free SiO_2 , and other trace elements, such as Mn, Mg, and Zn, Na, K, Ni, Cu, Pb, As, Sb, W, Sn, V (Junursyah, 2019).

CHAPTER

13

Social Welfare at the Small Settlement Centres in the Northern Corridor of Selangor, Malaysia

Yazid Saleh, Mohmadisa Hashim, Hanifah Mahat, Nasir Nayan, Saiyidatina Balkhis Norkhaidi and Mohamad Khairul Anuar Ghazali

Introduction

The central settlements are often becoming the focus of human activities in economic activity and served as a service centre. The physical development and current economic activities, the distribution of the population of a catchment area and the relationship of settlements with other small centres/small settlement (small town) around it influence the frequency of provision of economic activities (Rosmin, 2007). The central place can be referred to in various term; however, most geographers use different terms to refer to the centre place. Researchers such as Christaller (1933) used the term centralized settlements in explaining the Central Place Theory that he pioneered. Whereas in Malaysia, terms such as service centres have been used by earlier researchers such as Katiman and Khaw (1985) and Rosmin (2007). However, even though the terms are different, they still refer to the same meaning as the populated area. The roles and functions of a settlement centre are diverse, as well as changing from time to time. Its function is to facilitate economic activities and the provision of social amenities that residents need in a central location. For small-town centres, it often functions as a service centre that offers a range of basic services to meet the health, education, housing and water and electricity supply needs of the population. In addition, small towns provide the most basic needs and services to the rural community (Hamid, 2000).

Some of the functions of small towns in developing countries are derived from several previous studies such as Katiman (1991, 2000), Hamid (2000) dan Rosmin (2007). It is found that basic functions are offered in a small town that offers a wide range of social services, administration, economic activities, infrastructure facilities and communication facilities. The features of the functions offered, and the size of the population play

CHAPTER

14

Heritage City Sustainability Measurement: A Literature Review

Mohamad Khairul Anuar Ghazali, Yazid Saleh and Hanifah Mahat

Introduction

Urbanization is a process that happened a long time ago. According to Gist and Fava (1964); Tang and Lee, (2016), the urbanization has begun for 3500 years before century (BC). A long-term scale brought to the emergence of the heritage cities all over the place. The heritage city is the result of the dynamic process that contributes to a rich cultural heritage of value to the present and future generations. This cultural heritage needs to be preserved for the benefit of future generations. Every urban development that happened in specific scale of time has its characteristics and uniqueness that different from one with another. The characteristics and the uniqueness of the design of a specific city influenced by the living society at any time. The design of the buildings in a specific city can be pictured as the identity and the aesthetic value of the existing community (Syed Zainol Abidin, 1992). However, the influence of time and environment slowly erode the establishment of the heritage city in all over the place in the world. The old heritage city can cause the structure of the building mostly eroded and crack subsequently damaged (Jabatan Warisan Negara, 2018). Besides, the apparent threat is squeezed by the development of the modernization (Bandarin & van Oers, 2015). The heritage sites, buildings and monuments have been extensively demolished to provide access to larger-scale and profitable developments. This threat is because most heritage sites and buildings are in the downtown area where they are highly stratified and have high property values. Therefore, the heritage sites and buildings are sacrificed to meet the needs of the development that is beneficial to the landowners, residents, governments, and the economic levels of the country without regard to their heritage interests and rights (Ooi, 2012).

Not only that, but the intangible cultural heritage such as customs, lifestyles, musical arts, beliefs, rituals, and so on that had also become the tradition in centuries slowly eroded by globalization. The current trend of globalization has brought to lots of significant changes in the formation

CHAPTER

15

Preservation of Local Wisdom of Iriban Tradition in Semarang Regency Watershed Area, Indonesia

Thriwaty Aرسال

Introduction

Indonesia is a big country and is known to be multicultural. Each region in Indonesia has its cultural characteristics that should be developed and maintained as a national identity to be appreciated by the younger generation. The forms of local wisdom that existed in Indonesia are very diverse, including myths, folklore, oral traditions, *dolanan*, songs, and customs. Local wisdom will persist if the community maintains and implements existing views, rules, values, and norms. However, cultural developments in this era sometimes make local wisdom becomes increasingly forgotten by the community. Local wisdom exists with a very long process and has ancestral values in it with the existence of culture as concrete evidence. Gradually, culture is only used as an object or symbol without having any significance. This fact makes the value of local wisdom contained in a culture becomes increasingly forgotten by the next generation who only prioritizes a development without looking at the culture or local wisdom. Local wisdom has a close relationship with traditional culture in a region. In local wisdom, there are many views and rules so that the community has more foundation in determining an action such as people's daily behaviour. In general, ethics and moral values contained in local wisdom are taught from generation to generation, passed down from generation to generation through oral literature (among others in the form of proverbs, proverbs, and folklore), and manuscripts (Suyatno, 2013). Local wisdom taught from generation to generation is a culture that should be conserved. Each region has its own culture as a characteristic and there is local wisdom contained in it. The formation and development of culture greatly affect national identity and community unity plays a role in its formation. Sedyawati (2006) argued that in each community unity that formed the nation - both small and large scale - there were processes of cultural formation and development that functioned as national identity. Society has an important role in the formation of culture to continue to survive in the

CHAPTER

16

Green Technology Utilization and Management among Secondary School Students in Malaysia

Hanifah Mahat, Nur Syafini Yaacob, Saiyidatina Balkhis Norkhaidi, Mohmadisa Hashim, Nasir Nayan and Yazid Saleh

Introduction

Environmental pollution and destruction caused by human actions is an ongoing issue, despite the sustainable development agenda (United Nations, 1987) and the Sustainable Development Goals. To reduce pollution, green technology as a sector has been created to neutralize this destruction by creating equipment based on green technology applications. Green technology is part of the effort towards sustainable development and, to create environmental sustainability, individuals need to have the knowledge, skills, values, and attitudes that can boost mental and physical contribution to environmental sustainability (UNESCO, 2017). Green technology is seen as one of the most proactive and practical plans for science and technology to address the increasingly critical environmental issues (Bhardwaj & Neelam, 2015). The survival of human beings is fully dependent on the environment, and we should take the approach of overcoming environmental instability. In line with this, the Malaysian government, through the Ministry of Energy, Science, Technology, Environment, and Climate Change, has given priority to sustainable development through the introduction of green technology. Green technology plays a strategic role that is far beyond merely reaching for energy autonomy and controlling climate change. Green technology also contributes to the development of an informed society, which leads to sustainable energy practices and a better way of life (Hanifah *et al.*, 2017). In addition, various government agencies have introduced awareness programmes on energy efficiency and renewable energy, which have been part of the green technology sector since 2000 (Mohd *et al.*, 2013). The Malaysian government recognizes the importance of conserving natural resources from natural disasters for future generations, hence the 11th Malaysia Plan (Malaysia, 2016) emphasizes green growth strategies that reflect the government's

CHAPTER

17

Multicultural Identity and Adjustment by Students in Malaysian Public University

Samsudin Suhaili and Nur Nadia Lukmanulhakim

Introduction

The discourse of identity throughout the years involved the existence of multiple identity and conflicts that rises through it. Malaysia sees their own fair share of conflicts between identities as well. In 2019, a cross symbol which appeared on an apartment in Penang had caused a stir with the state mufti demanded an explanation of the incident (Siti Sofia, 2019). The incident caused quite a ruckus as Malaysia has been a Muslim majority with official religion of the constitution is Islam. Though the existence of multicultural identity in Malaysia can become a blessing at one point, in turn, it can also cause tensions and conflicts. Malaysia with multicultural society contains variety of groups, encompassing different ethnic, language and religion. As such, each of these multicultural categories have number of groups with their own identity. There are six multicultural categories, comprising ethnic, religion, gender, mental and physical ability, socioeconomic status and others (Banks & Banks, 2016). In Malaysian context, language has been deemed to an important component in Malaysia's multicultural setting. Malay language has been gazetted as the national language of Malaysia (Pesuruhjaya Penyemak Undang-Undang, 2006). This is to establish a national identity among the citizens through a unifying language. Therefore, the six multicultural categories used in this research is ethnic, religion, gender, mental and physical ability, socioeconomic status, and language.

The existence of diverse and multiple identities in Malaysian societies also caused a problem in forging a national identity. Top-down approach headed by the government defined national identity to be based off Nusantara's original residence with Islam as the base for religious identity (Kementerian Kebudayaan, 1971). Upholding to the monarchy institutions, gazetting Bahasa Melayu as the national language are all part of the approach by the government to forge national identity. However, this approach does not align to the interest of all party in Malaysian society.

Bibliography

- Abbas, H. B., & Routray, J. K. (2014). Vulnerability to flood-induced public health risks in Sudan. *Disaster Prevention and Management*, 23(4), 395-419.
- Abbas, M., Jason, B., & Tristan, J. -B. (2017). The urban heat island effect, its causes, and mitigation, with reference to the thermal properties of asphalt concrete. *Journal of Environmental Management*, 197, 522–538. <https://doi.org/10.1016/j.jenvman.2017.03.095>
- Abdul Aziz, H. (Ed.). (2011). *Pemuliharaan dan pemeliharaan warisan di Malaysia*. Pulau Pinang: Penerbit Universiti Sains Malaysia. (In Malay)
- Abdullah Mohammad Said. (1999). *Pengurusan sumber dan alam sekitar*. Shah Alam: Biroteks ITM. (In Malay)
- Adji, A. P. (2019). *Analisis komparatif pertanian padi dengan perlakuan organik dan anorganik serta dampaknya terhadap kualitas tanah di Desa Kayen dan Desa Jimbaran Kecamatan Kayen Kabupaten Pati*. Skripsi. Semarang: Universitas Negeri Semarang.
- Adnyana, M. O. (2016). Pengembangan sistem usaha pertanian berkelanjutan. *Forum Penelitian Agro Ekonomi*, 19(2), 38-49.
- Adnyana, M. O., & Simatupang, P. (1996). Pengkajian dan pengembangan sistem usaha pertanian berbasis komoditas unggulan. In *Prosiding Lokakarya BPTP/LPTP Se Indonesia*. BPTP Naibonat, Kupang.
- Alasi, A. W., Amin, M. S. M., Halim, A. G., Shafri, H. Z. M., & Aimrun, W. (2009). Validation of SWAT model for stream flow simulation and forecasting in Upper Bernam humid tropical river basin, Malaysia. *Hydrology and Earth System Science Discussions*, 6, 7581-7609.

- Alexandra, J., Larasati, E., Hidayat, Z., & Suryaningsih, M. (2019). Disaster relief-based on local wisdom (A case study of flood region watersheds/DAS Tuntang in Gubug Region of Grobogan District). *Journal of Arts and Humanities*, 8(9), 31-41. Retrieved from <https://doi.org/http://dx.doi.org/10.18533/journal.v8i9.1713>
- Alvarez, D. A., & Jones-Lepp, T. L. (2011). Chapter 11: Sampling and analysis of emerging pollutants. In Y. Li & K. Migliaccio (Eds.), *Water quality concepts, sampling, and analyses* (pp. 199-226). United States: CRC Press.
- Al-Hagla, K. S. (2010). Sustainable urban development in historical areas using the tourist trail approach: A case study of the Cultural Heritage and Urban Development (CHUD) project in Saida, Lebanon. *Cities*, 27(4), 234–248.
- Amal Najihah Muhamad Nor & Saiful Arif Abdullah. (2019). Developing urban green space classification system using multi-criteria: The case of Kuala Lumpur City, Malaysia. *Journal of Landscape Ecology (Czech Republic)*, 12(1), 16–36. <https://doi.org/10.2478/jlecol-2019-0002>
- American Public Health Association (APHA). (2005). *Standard methods for the examination of water and wastewater*. Washington, DC: American Public Health Association, American Water Works Association and Water Environment Federation.
- Amos Rapoport. (1990). *The meaning of the built environment: A nonverbal communication approach*. Arizona: University of Arizona Press.
- Amri, K., & Kanna, I. (2008). *Budidaya udang Vaname secara intensif, semi intensif dan tradisional*. Jakarta: PT. Gramedia Pustaka Utama.
- Anonim. (2012). Peraturan Pemerintah Republik Indonesia Nomor 37 Tahun 2012 Tentang Pengelolaan Daerah Aliran Sungai. Jakarta. (Unpublished).

- Anonim. (2013). Undang-undang Nomor 24 Tahun 2013 sebagai pengganti UU Nomor 23 tahun 2006 tentang administrasi kependudukan. Jakarta. Lembaran Negara RI. (Unpublished).
- Anonim. (2014). Peraturan Daerah Provinsi Jawa Tengah Nomor 15 Tahun 2014 Tentang Pengelolaan Daerah Aliran Sungai di Wilayah Provinsi Jawa Tengah. (Unpublished).
- Anonim. (2015a). Lampiran Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat. Nomor 04/PRT/M/2-14. Jakarta. (Unpublished).
- Anonim. (2015b). Peraturan Menteri Pekerjaan Umum dan Perumahan Rakyat Republik Indonesia Nomo 04/PRT/M/2015 Tentang Kriteria Penetapan Wilayah Sungai. (Unpublished).
- APHA. (1999). *Standard methods for the examination of water and wastewater*. 19th edition. Baltimore: Port City Press.
- Appendino, F. (2017). Balancing heritage conservation and sustainable development—The case of Bordeaux. *World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium- WMCAUS 2017, Jun 2017*. <https://doi.org/10.1088/1757-899X/245/6/062002>
- Asdak, C. (2010). *Hidrologi dan pengelolaan daerah aliran air sungai* (5th Ed.). Yogyakarta: Gadjah Mada University Press.
- Asiahwati Awi. (2015). *Tahap numerasi dan strategi penyelesaian masalah dalam bidang nombor bagi pelajar lepasan menengah*. (PhD Thesis). Universiti Sains Malaysia. (In Malay)
- Asian Development Bank (ADB). (2001). *Urban indicators for managing cities: City-data book*. Manila: Asia Development Bank.
- Australian Conservation Foundation. (2010). Sustainable cities index—Ranking Australia’s 20 largest cities in 2010. Retrieved from http://www.acfonline.org.au/sites/default/?les/resources/2010_ACF_SCI_Report_CompativeTable_and_Fact-Sheets.pdf

- Badan Pengelolaan Daerah Aliran Sungai (BPDAS). (2007). *Karakteristik DAS Tuntang dan Jragung*. Pemali Jratun. Retrieved from <http://www.bpdas-pemalijratus.net/indek/php.view=article&calid=51%3Akarakteristik-das&id=66%Adas-jragung-tuntang?option=com>
- Badan Pusat Statistik. (2013). Sensus pertanian 2013. Retrieved from <http://bps.go.id>
- Badan Pusat Statistik. (2018). Jawa Tengah dalam angka. Retrieved from <http://bps.go.id>
- Bader, N., & Bleischwitz, R. (2009). Measuring urban greenhouse gas emissions: The challenge of comparability. *Cities and Climate Change*, 2(3), 1-11.
- Badrudin. (2014). *Budidaya udang tambak Vannamei (Tambak semi intensif dengan instalasi pengolahan air limbah (IPAL))*. WWF - Indonesia.
- Bae, D. -H., Jung, I. -W., & Chang, H. (2008). Long-term trend of precipitation and runoff in Korean river basins. *Hydrological Processes*, 22, 2644-2656.
- Baharudin, Y., Maimon, A., & Salmijah, S. (2012). Beberapa peristiwa banjir besar dan tindakan mengawal banjir di Malaysia. In Y. Baharudin, A. Maimon, & S. Salmijah (Eds.), *Banjir besar Johor* (pp. 19-30). Bangi: Penerbit Universiti Kebangsaan Malaysia. (In Malay)
- Baker, D., Street, B., & Tomlin, A. (2008). *Navigating numeracies*. Retrieved from <https://link-springer-com.dbgw.lis.curtin.edu.au/content/pdf/10.1007%2F1-4020-3677-9.pdf>
- Bandarin, F., & van Oers, R. (2015). *Reconnecting the city: The historic urban landscape approach and the future of urban heritage*. United Kingdom: Wiley Blackwell.
- Bandarin, F., Hosagrahar, J., & Albernaz, F. (2011). Why development needs culture. In A. Pereira Roders & R. van Oers (Eds.), *Journal of Cultural Heritage Management and Sustainable Development* (pp. 15-25). Emerald.

- Banerjee, S., & Akuli, R. K. (2014). Advantages of green technology. *Social Issue and Environment Problems*, 3(9), 97-100.
- Banks, J. A., & Banks, C. A. M. (2016). *Multicultural education: Issues and perspectives* (9th Edition). United States: John Wiley & Sons.
- Banowati, E. (2009). *Kesiapan masyarakat dalam mewujudkan pembangunan sumber daya hutan berkelanjutan di kawasan hutan Muria Wilayah Pati-Jawa Tengah*. Laporan Penelitian Hibah Program Doktor. Yogyakarta: Universitas Gadjah Mada.
- Banowati, E. (2001). *Agrosilvikultur dan peningkatan pendapatan pesanggem*. Thesis. Yogyakarta: Fakultas Geografi, Universitas Gadjah Mada.
- Banowati, E., & Prajanti, S. D. W. (2017). Developing the understand cropping system (PLDT) for sustainable livelihood. *Management of Environmental Quality: An International Journal*, 28(5), 769-782.
- Banowati, E., & Sriyanto. (2013). *Geografi pertanian*. Yogyakarta: Penerbit Ombak.
- Bariweni, P. A., Tawari, C. C., & Abowei, J. F. N. (2012). Some environmental effects of flooding in the Niger Delta Region of Nigeria. *International Journal of Fisheries and Aquatic Sciences*, 1(1), 35-46.
- Basiago, A. D. (1998). Economic, social, and environmental sustainability in development theory and urban planning practice. *Environmentalist*, 19, 145–161.
- Basistha, A., Arya, D. S., & Goel, N. K. (2009). Analysis of historical changes in rainfall in the Indian Himalaya. *International Journal of Climatology*, 29, 555-572.
- Bellanger, B., Houn, S., Staeinman, P., Chabaux, F., Velasquez, F., Valles, V., Arn, K., Clauer, N., & Mariott, A. (2004). Oxidic-anoxic condition in the water column of a tropical freshwater reservoir (Pena-large dam, N.W. Venezuela). *Applied Geochemistry*, 19, 1295-1314.

- Benacer, D., Kwai, L. T., Ng, C. M., Khebir, V., Galloway, R. L., Hartskeerl, R. A., & Siti Nursheena, M. Z. (2016). Epidemiology of human leptospirosis in Malaysia, 2004–2012. *Acta Tropica*, *157*, 162-168.
- Bhardwaj, M., & Neelam. (2015). The advantages and disadvantages of questionnaires. *Journal of Basic and Applied Engineering Research*, *2*(22), 1957-1960.
- Black, M. C. (2001). *Water quality standards for North Carolina's endangered mussels*. Final Report. Department of health Science's, University of Georgia, Athens, GA, USA.
- BNPB. (2007). *Undang-Undang Republik Indonesia Nomor 24 Tahun 2007 Tentang Penanggulangan Bencana*. Retrieved from https://bnpb.go.id/ppid/file/UU_24_2007.pdf
- Bokhari, M., Abdullah, A. N., Syed, S. N., Jano, Z., & Saadan, R. (2014). Hubungan antara kefahaman, kesedaran dan amalan teknologi hijau berdasarkan perspektif etnik di negeri Melaka. *Journal of Human Capital Development*, *7*(2), 33-46. (In Malay)
- Bourne, A., Armstrong, N., & Jones, G. (2002). A preliminary estimate of total nitrogen and total phosphorus loading to streams in Manitoba, Canada. *Manitoba Conservation Report No. 2002–4*. Retrieved from <https://www.gov.mb.ca/sd/waterstewardship/reports/quality>
- Bowes, M. J., Jarvie, H. P., Halliday, S. J., Skeffington, R. A., Wade, A. J. & Loewenthal, M. (2015). Characterising phosphorus and nitrate inputs to a rural river using high-frequency concentration–flow relationships. *Science of the Total Environment*, *511*, 608-620.
- Bronto, S. (2007). Genesis endapan aluvium dataran Purworejo Jawa Tengah: Implikasinya terhadap sumber daya geologi. *Jurnal Geologi Indonesia*, *1*(4), 207–215.
- Brooks, K. N., Ffolliott, P. F., & Magner, J. A. (2013). *Hydrology and the management of watersheds* (4th ed.). Ames, Iowa: Wiley-Blackwell.

- Brown, M., Askew, M., Baker, D., Denvir, H., & Millett, A. (1998). Is the national numeracy strategy research-based? *British Journal of Educational Studies*, 46, 362-385.
- Brundtland, G. H. (1987). *Report of the World Commission on Environment and Development: Our common future*. Retrieved from <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf>
- Bruner, A., Gullison, R., Rice, R., & Fonseca, G. (2001). Effectiveness of parks in protecting tropical biodiversity. *Science (New York, N.Y.)*, 291, 125-128. Retrieved from <https://doi.org/10.1126/science.291.5501.125>
- Brunetti, M., Maugeri, M., Nanni, T. & Navarra A. (2002). Droughts and extreme events in regional daily Italian precipitation series, *International Journal of Climatology*, 22, 145-147.
- Brunetti, M., Colacino, M., Maugeri, M., & Nanni, T. (2001). Trends in the daily intensity of precipitation in Italy from 1951 to 1996. *International Journal of Climatology*, 21, 299-316.
- Brunetti, M., Maugeri, M., & Nanni, T. (2000). Variations of temperature and precipitation in Italy from 1866 to 1995. *Theoretical and Applied Climatology*, 65, 165-174.
- Bureau of Statistics Semarang Regency. (2015). *Statistik industri besar dan sedang Kabupaten Semarang 2013*. Semarang: Badan Pusat Statistik.
- Bureau of Statistics Semarang Regency. (2019). *Penduduk Kabupaten Semarang*. Semarang: Badan Pusat Statistik.
- Burn, D. H., & Elnur, M. A. H. (2002). Detection of hydrologic trends and variability. *Journal of Hydrology*, 255, 107-122.
- Burn, D. H. (1994). Hydrological effects of climate change in west central Canada. *Journal of Hydrology*, 160, 53-70.
- Cahyadi, A. (2012). Analisis pengaruh perubahan penggunaan lahan terhadap retensi potensial air oleh tanah pada kejadian hujan sesaat (Studi kasus perubahan penggunaan lahan di DAS Garang Jawa Tengah). In. *Seminar Nasional Informatika 2012 UPN "Veteran" Yogyakarta*.

- Caloiero, T., Coscarelli, R., Ferrari, E., & Mancini, M. (2011). Trend detection of annual and seasonal rainfall in Calabria (Southern Italy). *International Journal of Climatology*, 31(1), 44-56.
- Cambridge Assessment. (2013). *What is literacy? An investigation into definitions of English as a subject and the relationship between English, literacy and 'being literate'*. Retrieved from <http://www.cambridgeassessment.org.uk/images/130433-what-is-literacy-an-investigation-into-definitions-of-english-as-a-subject-and-the-relationship-between-english-literacy-and-being-literate-.pdf>
- Candice, S. (2013). Carbon literacy practices: Textual footprints between school and home in children's construction of knowledge about climate change. *Local Environment: The International Journal of Justice and Sustainability*, 18(3), 289–304.
- Caprotti, F., Cowley, R., Datta, A., Broto, V. C., Gao, E., Georgeson, L., & Joss, S. (2017). The new urban agenda: Key opportunities and challenges for policy and practice. *Urban Research & Practice*, 10(3), 367-378.
- Caruso, B. S. (2001). Regional river flow, water quality, aquatic ecological impacts and recovery from drought. *Hydrological Science Journal*, 46 (5), 677-669.
- Chamhuri, S., Rospidah, G., & Sharina, A. H. (Eds.). (2014). *Pembangunan lestari di Malaysia: Harapan dan kenyataan*. Kuala Lumpur: Dewan Bahasa dan Pustaka. (In Malay)
- Chan, N. W. (1995). Flood disaster management in Malaysia: An evaluation of the effectiveness of flood delivery system. *Disaster Prevention and Management: An International Journal*, 4(4), 22-29.
- Chen, S. T., Kuo, C. C., & Yu, P. S. (2009). Historical trends and variability of meteorological droughts in Taiwan. *Hydrological Sciences Journal*, 54(3), 430–441.
- Chin, D. A. (2006). *Water-quality engineering in natural systems*. New Jersey: John Wiley & Sons.

- Choon, S. W., Chamhuri, S., Joy, J. P., Abdul Aziz, J., & Halimaton Saadiah. (2014). Ke arah pembangunan indeks bandar lestari Malaysia. In S. Chamhuri, G. Rospidah, & A. H. Sharina (Eds.), *Pembangunan lestari di Malaysia: Harapan dan kenyataan* (pp. 399–424). Kuala Lumpur: Dewan Bahasa dan Pustaka. (In Malay)
- CHS. (2004). *Urban indicators guidelines: Monitoring the habitat agenda and the millennium development goals*. Nairobi: United Nations Centre for Human Settlements.
- Christaller, W. (1933). *Central place in Southern Germany*. (Translate by C.W. Baskin 1966). New Jersey: Prentice-Hall.
- Coccosis, H. (2008). Cultural heritage, local resources and sustainable tourism. *International Journal of Services Technology and Management*, 10(1), 8–14.
- Collins, A. J., Pulley, S., Foster, I. D. L., Gellis, A., Porto, P., & Horowitz, A. J. (2017). Sediment source fingerprinting as an aid to catchment management: A review of the current state of knowledge and a methodological decision-tree for end-users. *J. Environ. Mgmt.*, 194, 1-3.
- Copeland, C. (2005). *Hurricane-damaged drinking water and wastewater facilities: Impacts, needs, and response*. Congressional Research Service, Library of Congress.
- Dahlani & Setijanti, P. (2015). Local wisdom in built environment in globalization era. *International Journal of Education and Research*, 3(6), 157-166. Retrieved from <http://www.ijern.com/journal/2015/June-2015/13.pdf>
- Danoedoro, P. (2016). *Membangun sistem klasifikasi penggunaan lahan multiguna berbasis penginderaan jauh dan sistem informasi geografis untuk pengelolaan lingkungan*. Yogyakarta: Fakultas Geografi UGM.
- de Lima, M. I. P., Marques, A. C. P., de Lima, J. L. M. P., & Coelho, M. F. E. S. (2005). Precipitation trends in mainland Portugal in the period 1941-2000. In *The Forth Inter-Celtic Colloquium on Hydrology and Management of Water Resources*. Guimarães, Portugal, 11-14 July.

- Departemen Kehutanan. (2007). *Lahan kritis per BPDAS tahun 2007*. Situs Resmi Departemen Kehutanan. Retrieved from <http://www.dephut.go.id>.
- Department of Environment (DOE). (2014). *Malaysia environmental quality report 2014*. Putrajaya: Ministry of Science, Technology and Environment.
- Department of Environment (DOE). (2015). *Malaysia environmental quality report 2015*. Putrajaya: Ministry of Science, Technology and Environment.
- Department of Irrigation & Drainage. (2012). *Portal rasmi bagi Jabatan Pengairan dan Saliran Malaysia, Kementerian Sumber Asli & Sekitar*. Diperoleh dari <http://www.water.gov.my/index.php?lang=my>, 5 Julai. (In Malay)
- Department of Irrigation and Drainage (DID). (2009). *Study on the river water quality trends and indexes in Peninsular Malaysia*. Water Resources Publication, No 21.
- Department of Irrigation and Drainage (DID). (2013). *Flood management: Programme and activities*. Retrieved March 22, 2016, from <http://www.water.gov.my/our-services-mainmenu-252/flood-mitigation-mainmenu-323/programme-aamp-activities-mainmenu-199?lang=en>
- Department of Irrigation Malaysia (DID). (1986). *Hydrological data: River discharge and suspended sediment records 1975-1980*. Kuala Lumpur: Ministry of Agriculture Malaysia.
- Department of Statistics Malaysia. (2010). *Laporan Banci dan Perumahan Penduduk*. Putrajaya: Jabatan Perangkaan Malaysia. (In Malay)
- Dewi, N. K., & Rudiarto, I. (2013). Identifikasi alih fungsi lahan pertanian dan kondisi sosial ekonomi masyarakat daerah pinggiran di kecamatan Gunungpati Kota Semarang. *Jurnal Wilayah dan Lingkungan*, 1(2), 175-188.

- Dimiyati, A. S., Bahrein, E. D., Muchari, & Nurbaeti, B. (1998). Pembangunan sistem usaha pertanian berkelanjutan. In *Prosiding Analisis Ketersediaan Sumberdaya Pangan dan Pembangunan Pertanian Berkelanjutan*. Badan Litbang Pertanian 1997-1998.
- Dimiyati, N. (1992). *Strategies for sustainable mountain agriculture in the Hindu Kush-Himalayan Region*. SCS. Ankeny. Iowa. USA.
- Dunlap, R. E., & Van Liere, K. D. (1978). The new environmental paradigm. *Journal of Environmental Education*, 9(4), 10-19.
- eBanjir Negeri Kelantan. (2015). *Laporan catatan aras air tertinggi mengikut tempat*. Retrieved March 20, 2016, from http://ebanjir.kelantan.gov.my/p_parpt01.php (In Malay)
- Effendi, E. (2008). *Kajian model pengelolaan daerah aliran sungai (DAS) Terpadu*. Direktorat Kehutanan dan Konservasi Sumberdaya Air, Bappenas.
- El-Titi, A., & Landes, H. (1990). Integrated farming system of Lautenbach: A practical contribution toward sustainable agriculture in Europe. In Edwards, C. A., Lar, R., Madden, P., Miller, R. H., & House, G. (Eds.), *Sustainable agricultural systems* (pp. 265-286). Ankeny. Iowa, USA: SCS.
- Englesberg, C. (2009). *Green technology high school academies: Pioneers at the crossroads of economic, educational, and environmental challenges*. Urban and Environmental Policy Institute Occidental College (online). Retrieved from <https://www.oxy.edu/sites/default/files/assets/UEP/Comps/2009/Englesberg%2009%20Green%20Technology%20%20Academies%204-19.pdf>
- ESCAP. (2007). *Some sustainable development indicators sets and indices*. Bangkok: United Nation Economic and Social Commission for Asia and the Pacific.
- European Green Capital Award. (2017). *Will your city be the European Green Capital in 2017?* Retrieved from http://ec.europa.eu/environment/europeangreencapital/wpcontent/uploads/2013/02/Willyour-cit2017_Web Copy-F01.pdf

- Evans, J., Yasukawa, K., Mallows, D., & Creese, B. (2017). Numeracy skills and the numerate environment: Affordances and demands. *Adults Learning Mathematics: An International Journal*, 12(1), 17–26.
- Ewing, B. A. R. (2010). *Calculation methodology for the national footprint accounts*. Oakland: Global Footprint Network.
- FAO. (2011). FAO soil and land degradation. Report 3, Retrieved from <https://fao.org>
- Fatimah, Y., Katiman, R., & Zikri, M. (2008). Bandar berdaya saing vis-a-vis pembangunan bandar lestari: Suatu wacana tentang pembangunan bandar di Malaysia. *Geografia Malaysian Journal of Society and Space*, 4(1), 85–98. (In Malay)
- Fazli, M., & Yong, T. Y. (2006). Tahap keprihatinan alam sekitar dan amalan kepenggunaan hijau pengguna di Petaling Jaya, Selangor. *Pertanika Journal of Social Science & Humanities*, 14(2), 95-109. (In Malay)
- Few, R., Tran, P. G., & Hong, B. T. T. (2004). *Living with floods: Health risks and coping strategies of the urban poor in Vietnam*. Retrieved April 12, 2016, from https://www.uea.ac.uk/polopoly_fs/1.19249!studyreportfinal.pdf
- Fildes, R. (2006). The forecasting journals and their contribution to forecasting research: Citation analysis and expert opinion. *International Journal of Forecasting*, 22(3), 415-432.
- Findayani, A. (2018). Kesiap siagaan masyarakat dalam penanggulangan banjir di Kota Semarang. *Jurnal Geografi: Media Informasi Pengembangan dan Profesi Kegeografian*, 12(1), 102-114.
- Forest Department of Peninsular Malaysia. (2009). *Malaysia environment and forest report 2019*. Retrieved from <http://www.forestry.gov.my/index.php/ms/pusat-sumber/statistik.html>
- Fu, G., Barber, M. E., & Chen, S. (2009). Hydro-climatic variability and trends in Washington State for the last 50 years. *Hydrological Processes*, doi:10.1002/hyp.7527

- Gaillard, J.-C., Pangilinan, M. R. M., Cadag, J. R., & Masson, V. L. (2008). Living with increasing floods: Insights from a rural Philippine community. *Disaster Prevention and Management*, 17(3), 383-395.
- Gal, I. (2002). Adults' statistical literacy: Meanings, components, responsibilities. *International Statistical Review*, 70(1), 1-5.
- Gan, T. Y. (1998). Hydro climatic trends and possible climatic warming in the Canadian Prairies. *Water Resources Research*, 34, 3009-3015.
- Garau, C. (2015). Perspective on cultural and sustainable rural tourism in a smart region: The case study of Marmilla in Sardinia (Italy). *Sustainability*, 7, 6412–6434.
- Gillett, G. (2005). *Access to geography: Ecosystems*. Hodder Murray: Hodder Education.
- Ginting, S. (2009). *Kajian erosi dan sedimentasi di DAS Garang. Laporan eksekutif*. Balai Hidrologi dan Tata Air, Pusat Litbang Sumber Daya Air.
- Ginting, S., & Putuhena. W. M. (2014). Jakarta-Flood Early Warning System (J-FEWS). *Jurnal Sumber Daya Air*, 10(1) 71-84.
- Gist, N. P., & Fava, S. F. (1964). *Urban society*. New York: Crowell.
- Godsey, S. E., Kirchner, J. W., & Clow, D. W. (2009). Concentration–discharge relationships reflect chemostatic characteristics of US catchments. *Hydrological Processes*, 23(13), 1844-1864.
- Goos, M., Dole, S., & Geiger, V. (2012). *Numeracy across the curriculum*. Retrieved from <https://files.eric.ed.gov/fulltext/EJ974975.pdf>
- Gordon, N. D. (1992). *Stream hydrology: An introduction for ecologists*. Chichester: John Wiley & Sons.
- Gray, N. F. (2008). *Drinking water quality: Problems and solutions* (2nd Ed.). Cambridge, New York: Cambridge University Press.

- Guilford, J. P. (1965). *Fundamental statistics in psychology and education*. New-York: McGraw-Hill.
- Guzmán, P. C., Pereira Roders, A. R., & Colenbrander, B. J. F. (2014). Bridging the gap between urban development and cultural heritage protection. In *Conference Proceedings' Impact Assessment for Social and Economic Development, 34 Th Annual Conference of the International Association for Impact Assessment*, 8–11.
- Habitat III. (2016). *New urban agenda*. Retrieved from <http://habitat3.org/the-new-urban-agenda/>
- Hadi, A. S., Idrus, S., & Shah, A. H. H. (2004). Persekitaran bandar lestari untuk kesejahteraan komuniti. *Malaysian Journal of Environmental Management*, 5, 3–29. (In Malay)
- Hadi Sudharto, P. (2012). *Manajemen lingkungan*. Yogyakarta: Thafa Media.
- Hamid, S. (2000). *Ciri-ciri dan peranan bandar kecil dalam pembangunan wilayah: Kajian di Wilayah Johor Timur*. (Tesis PhD). Fakulti Sains Sosial dan Kemanusiaan, Universiti Kebangsaan Malaysia. (In Malay)
- Hammond, G. (2007). Correspondance: Time to give due weight to the carbon footprint issue. *Nature*, 445(7125), 256.
- Hanifah, M., Mohmadisa, H., Yazid, S., Nasir, N., & Saiyidatina Balkhis, N. (2017). Pengetahuan dan amalan hijau dalam kalangan murid sekolah rendah. *Jurnal Pendidikan Malaysia*, 42(1), 41-49. (In Malay)
- Hanifah, M., Shahrudin, I., Mohmadisa, H., Nasir, N., & Yazid, S. (2015). Transforming sustainability development education in Malaysian school through greening. *Review of International Geographical Education Online*, 5(1), 77-94.
- Hardoyo, S. R. (2013). *Penggunaan dan tata guna lahan*. Yogyakarta: Penerbit Ombak.

- Haryati Shafii & Nurasyikin Miskam. (2011). Pembentukan penunjuk dan indeks kualiti hidup bagi mengukur kesejahteraan hidup masyarakat di Pekan Parit Raja , Johor. In *Persidangan Kebangsaan Geografi dan Alam Sekitar Kali Ke 3*. Universiti Pendidikan Sultan Idris, Tanjong Malim. (In Malay)
- Haryati Shafii & Sharifah Meryam Shareh Musa. (2010). Urban transportation: Issue and solution. *Journal of Techno-Social*, 2(2), 31–46.
- Hayati, R. (2017). *Kerentanan dan strategi penghidupan komunita petani lahan pasir pantai (Studi kasus di Dusun Gupit IV, Desa Karangsewu, Kecamatan Galur dan Dusun Ngentak, Desa Jangkarana, Kecamatan Temon, Kabupaten Kulonprogo)*. Disertasi Gadjah Mada University. Retrieved from http://etd.repository.ugm.ac.id/index.php?mod=penelitian_detail&sub=PenelitianDetail&act=view&typ=html&buku_id=117203&obyek_id=4
- Hilman, P. M., Suprpto, S. J., Sunuhadi, D. N., Tampubolon, A., Rina, W., Widhayatna, D., Pardianto, B., Franklin, Candra, Sukaesih, Ostman, I., Sukmayana, I., Oktaviani, P., Yuningsih, E. T., Dinarsih, D., Sutisna, D. T, Ulfah, R. M., & Rahmawati, R. (2014). *Pasir besi di Indonesia: Geologi, eksplorasi dan pemanfaatannya*. Retrieved from <http://ftgeologi.unpad.ac.id/wp-content/uploads/2018/05/Pasir-Besi-di-Indonesia-Geologi-Eksplorasi-dan-Pemanfaatannya.pdf>
- Hirsch, R. M., & Slack, J. R. (1984). A nonparametric trend test for seasonal data with serial dependence. *Water Resource Research*, 20(1), 727-732.
- Hirsch, R. M., Slack, J. R., & Smith, R. A. (1982). Techniques of trend analysis for monthly water quality analysis. *Water Resource Research*, 18(1), 107-121.
- Horrigan, L., Lawrence, R. S., & Walker, P. (2002). How sustainable agriculture can address the environmental and human health harms of industrial agriculture. *Environmental Health Perspectives*, 110(5), 445-456.

- Huang, Y., Cai, J., Yin, H., & Cai, M. (2009). Correlation of precipitation to temperature variation in the Huanghe River (Yellow River) basin during 1957-2006. *Journal of Hydrology*, 372, 1-8.
- Ibrahim, N., Hamid, S., & Khairul Hisyam, K. (2013). Socio economic transformation of rice cultivation area in Sabak Bernam, Malaysia. In *Rural Research Planning Group (RRFG) Workshop, Rural Transformation and Institutional Development and Annual Meeting on 9-10 September 2013, at ITB, Bandung*.
- Indrawardana, I. (2012). Kearifan lokal adat masyarakat sunda dalam hubungan dengan lingkungan alam. *Jurnal Komunitas*, 4(1), 1-8. Retrieved from <https://doi.org/10.15294/komunitas.v4i1.2390>
- Intergovernmental Panel on Climate Change (IPCC)*. 2007. *Climate change 2007: The physical science basis*. Geneva, Switzerland: WMO, UNEP.
- Irawan, B. (2005). Konversi lahan sawah: Potensi dampak, pola pemanfaatannya dan faktor determinan. *Forum Penelitian Agro Ekonomi*, 23(1), 1-18.
- Isaka, S., & Ashraf M. A. (2017). Impact of soil erosion and degradation on water quality: A review. *Geology, Ecology and Landscape*, 1, 1-11.
- Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia. (2016). *Dasar Perbandaran Negara Kedua*. Kuala Lumpur: Kementerian Kesejahteraan Bandar, Perumahan & Kerajaan Tempatan. Retrieved from <https://www.pmo.gov.my/dokumenattached/Dasar/Dasar-Perbandaran-Negara-Kedua.pdf> . (In Malay)
- Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia. (2005). *Garis panduan dan manual penggunaan petunjuk bandar Malaysia (MurniNet)*. Kuala Lumpur: Jabatan Perancangan Bandar dan Desa Semenanjung Malaysia. (In Malay)
- Jabatan Warisan Negara. (2008). *Keris sebagai elemen warisan tidak ketara*. Putrajaya: Kementerian Pelancongan, Seni dan Budaya. (In Malay)
- Jackson, W. (1980). *New roots for agriculture*. Nebraska: University of Nebraska Press.

- JadwalTravel.com. (2021). *Embung Sebligo Lerep – Aktivitas Wisata, Harga Tiket dan Lokasi*. <https://jadwaltravel.com/embung-sebligo-lerep/>.
- James, A. G., & James, B. (2017). Discharge measurement and streamflow analysis. In F.R. Hauer & G. A. Lamberti (Eds.) *Method in stream ecology, 1. Ecosystem structure*. New York: Academic Press.
- Jenks, M., Jenks, M., & Dempsey, N. (2005). *Future form and design for sustainable cities*. United Kingdom: Architectural Press.
- Jenks, M., & Jones, C. (2010). *Dimension of the sustainable city*. New York: Springer International Publishing.
- Jorge, E. H., Diana, M., & David, S. (1995). *Environmental problem in third world cities*. London: Earthscan Publications Ltd.
- Juniarta, H. P., Susilo, E., & Primyastanto, M. (2013). Kajian profil kearifan lokal masyarakat pesisir Pulau Gili Kecamatan Sumberasih Kabupaten Probolinggo Jawa Timur. *ECSoFiM (Economic and Social of Fisheries and Marine Journal)*, 1(1), 11-25.
- Junursyah, G. M. L. (2019). Potensi endapan pasir besi di daerah Grabag dan sekitarnya berdasarkan data geomagnet. *Jurnal Geologi Dan Sumberdaya Mineral*, 20(2), 75–83.
- Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarising impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, 2(10), 732–735. doi:10.1038/nclimate1547
- Kahya, E., & Kalayci, S. (2004). Trend analysis of streamflow in Turkey. *Journal of Hydrology*, 289, 128-144.
- Kaklauskas, A., Amaratunga, D., & Haigh, R. (2009). Knowledge model for post-disaster management. *International Journal of Strategic Property Management*, 13(2), 117-128.
- Kalff, J. (2002) *Limnology*. Upper Saddle River, N.J: Prentice Hall.

- Kamarul Aryffin Baharuddin, Shaik Farid Abdull Wahab, Nik Hisamuddin Nik Ab Rahman, Nik Arif Nik Mohamad, Tuan Hairulnizam Tuan Kamauzaman, Abu Yazid Md Noh, & Mohd Roslani Abdul Majid. (2015). The record-setting flood of 2014 in Kelantan: Challenges and recommendations from an emergency medicine perspective and why the medical campus stood dry. *Malays J Med Sci.*, 22(2), 1-7.
- Kamil N. N., & Omar, S. F. (2017). Impact of El Nino and La Nina on palm industry. *Oil Palm Bulletin*, 74, 1-6.
- Karmilah, A., & Jamilah, A. (2014). Impak pemeraksanaan teknologi hijau terhadap amalan pengamal perhubungan awam hijau di Malaysia. *Akademika*, 84(3), 29-40. (In Malay)
- Kathleen, H. (2011). Integrated crop/livestock agriculture in the United States: A review. *J. Sustainable Agric.*, 35, 376-393.
- Katiman Rostam. (1988). *Pengantar geografi bandar*. Bangi: Penerbit Universiti Kebangsaan Malaysia. (In Malay)
- Katiman, R., & Khaw, L. B. (1985). Hierarki kefungisian pusat peringkat rendah: Contoh dari Hulu Terengganu. *Ilmu Alam*, 14 & 15, 15-34. (In Malay)
- Katiman, R. (1991). Problems and prospects of rural services in Malaysia with special reference to settlement in Hilir Perak. *Ilmu Alam*, 20, 37-53.
- Katiman, R. (2000). Pemandaran dalam era globalisasi: Beberapa kesan terhadap ruang ekonomi desa di pinggiran metropolitan. In *Prosiding Seminar Antarabangsa Alam, Manusia dan Pembangunannya di Malaysia: Dasar Starategi dan Kelestariannya*. Anjuran Persatuan Kebangsaan Geografi Malaysia dan Jabatan Geografi Universiti Kebangsaan Malaysia, pada 19 Jun 2000 Bangi, Malaysia. (In Malay)
- Katiman, R. (2005). Transformasi ekonomi dan perbandaran di koridor Kemaman-Dungun, Terengganu: Keterlibatan isi rumah Melayu. *Sari*, 23, 15-36. (In Malay)

- Katiman, R. (2006). Pemandaran dan perkembangan wilayah metropolitan lanjutan Lembah Klang-Langat, Malaysia. *e-BANGI: Jurnal Sains Sosial dan Kemanusiaan*, 1(1),1-27. (In Malay)
- Katiman, R., Mochamad, R., Er, A. C., Abdul Rahim, M. N. , Zaini, S. , Norazuan, M. H., & Aishah@Esah, M. (2010). Pemandaran dan rebanan bandar di pinggir Wilayah Metropolitan Klang-Langat. *Geografia*, 6(2), 37 – 50. (In Malay)
- Katiman, R. (2014). Kerja lapangan dalam aspek transformasi desa-bandar dan pemandaran. In Wan Ruslan Ismail, Narimah Samat, & Noorah Yusof. (Eds.), *Kerja lapangan: Teknik, prosedur dan aplikasi dalam geografi*. Minden, Pulau Pinang: Penerbit Universiti Sains Malaysia. (In Malay)
- Kauppi, L., Pietilainen, P., & Knuuttila S. (1993). Impacts of agricultural nutrient loading on finnish watercourses. *Water Science & Technology*, 28(3-5), 461-471.
- Kawuryan, F. (2012). Supportif relationships dan kecerdasan moral sebagai pengendali perilaku agresif. *Jurnal Sosial dan Budaya*, 5(1), 48-57.
- Kementerian Kemajuan Luar Bandar & Wilayah. (2011). *Definisi bandar dan luar bandar oleh Jabatan Perangkaan Malaysia, Banci Penduduk dan Perumahan 2010*. Buletin Perangkaan KKLW 2011. Retrieved from www.rurallink.gov.my (In Malay)
- Kementerian Wilayah Persekutuan. (2020). *Malaysian Urban Rural National Indicators Network for Sustainable Development (MurniNet2.0)*. Retrieved from <http://murninetsv2.townplan.gov.my/>
- Kementerian Kebudayaan. (1971). *Dasar Kebudayaan Kebangsaan*. Retrieved from http://www.pmo.gov.my/dokumenattached/Dasar/04Dasar_Kebudayaan_Kebangsaan.pdf (In Malay)
- Khaironi, K., Soesilowati, E., & Aرسال, T. (2017). Kearifan lokal masyarakat etnis Gayo sebagai destinasi wisata budaya di Kota Takengon. *Journal of Educational Social Studies*, 6(2), 99–110.

- Kongprasertamorn, K. (2007). Local wisdom, environmental protection and community development: The clam farmers in Tambon Bangkhunsai, Phetchaburi Province, Thailand. *MANUSYA - Journal of Humanities*, 10, 1–10. Retrieved from <https://doi.org/10.1163/26659077-01001001>
- Kowarik, I. (2011). Novel urban ecosystems, biodiversity, and conservation. *Environmental Pollution*, 159(8–9), 1974–1983. <https://doi.org/10.1016/j.envpol.2011.02.022>
- Krejcie, R. V., & Morgan, D. W. (1970). Determining sample size for research activities. *Educational and Psychological Measurement*, 30, 607-610.
- Kukaswadia, A. (2013). *Mathematical literacy: A necessary skill for the 21st century*. Retrieved from <http://blogs.plos.org/scied/2013/02/11/mathematical-literacy-a-necessary-skill-for-the-21st-century/>
- Kumar, V., Cheng, S. Y. C., & Singh, A. K. (2016). Impact of flood on rural population and strategies for mitigation: A case study of Darbhanga District, Bihar State, India. *Contemporary Rural Social Work*, 8(1), 45–56.
- Kumar, V., Jain, S. K., & Singh, Y. (2010). Analysis of long-term rainfall trends in India. *Hydrological Sciences Journal*, 55, 484-496.
- Kundzewicz, Z. W., & Robson, A. J. (2000). *Detecting trend and other changes in hydrological data*. Geneva: World Meteorological Organization Report. WMO/TD-No.1013.
- Kurniawan, U. (2012). *Evaluasi kegiatan reklamasi penambangan pasir besi Kutoarjo (KP96PPO347) di Kecamatan Grabag Kabupaten Purworejo* [UPN “Veteran” Yogyakarta.]. Retrieved from <http://repository.upnyk.ac.id/3516/>
- Kwarteng, A. Y., Dorvlo, A. S., & Vijaya Kumar, G. T. (2009). Analysis of a 27-year rainfall data (1977–2003) in the Sultanate of Oman. *International Journal of Climatology*, 29, 605– 617.
- Kysely J. (2009) [Trends in heavy precipitation in the Czech Republic over 1961-2005](#). *International Journal of Climatology*, 29, 1745-1758.

- Landell, K. (1997). *Management by menu*. London: John Wiley & Sons Inc.
- Lasabada, R. (2013). Pembangunan wilayah pesisir dan lautan dalam perspektif negara kepulauan Republik Indonesia. *Jurnal Ilmiah Platax, 1-2*, 92-101. Retrieved from <http://ejournal.unsrat.ac.id/index.php/platax>:-
- Latifunnisa, Y. (2019). *Strategi penghidupan rumah tangga untuk menjaga kelestarian lingkungan sungai di DAS Garang Hulu*. Universitas Negeri Semarang. Retrieved from <https://lib.unnes.ac.id/34193/1/3211414008maria.pdf>
- LAWA (Länderarbeitsgemeinschaft Wasser): Beurteilung der Wasserbeschaffenheit von Fließgewässern in der Bundesrepublik Deutschland—Chemische Gewässergüteklassifikation, Kulturbuchverlag Berlin, (1998).
- Lawler, D. M., Petts, G. E., Foster, I. D. L., & Harper, S. (2006). Turbidity dynamics during spring storm events in an urban headwater river system: The Upper Tame, West Midlands, United Kingdom. *Science of the Total Environment, 360*(1–3), 109–126.
- Lázár, A. N., Clarke, D., Adams, H., Akanda, A. R., Szabo, S., Nicholls, R. J., Matthews, Z., Begum, D., Saleh, A. F. M., Abedin, M. A., Payo, A., Streatfield, P. K., Hutton, C., Mondal, M. S., & Moslehuddin, A. Z. M. (2015). Agricultural livelihoods in coastal Bangladesh under climate and environmental change - A model framework. *Environmental Sciences: Processes and Impacts, 17*(6), 1018–1031.
- Lehmann, K. (2017). Selected issues of the future environmental policy in Europe with special reference to urban development and the example of a greening project in Berlin-Spandau. In *Proceedings 24th ISUF 2017 - City and Territory in the Globalization Age* (pp. 1719–1729). Valencia: Universitat Politècnica València.
- Li, Y., & Migliaccio, K. W. (2011). Chapter 1: Introduction. In Y. Li & K. W. Migliaccio (Eds.), *Water quality concepts, sampling, and analyses*. Boca Raton, FL: CRC Press.

- Lie, D., Carter-Pokras, O., Braun, B., & Coleman, C. (2012). What do health literacy and cultural competence have in common? Calling for a collaborative pedagogy. *J Health Commun*, 17(3), 13–22.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of Psychology*, 140, 1–55.
- Lins, H. F., & Slack, J. R. (1999). Streamflow trends in the United States. *Geophysical Research Letters*, 26(2), 227–230.
- Littlewood, I. G. (1992). *Estimating contaminant loads in rivers: A review*. Institute of Hydrology Report No. 17. Institute of Hydrology, Wallingford, UK. Retrieved from <http://nora.nerc.ac.uk/>
- Liu, K., Lobb, D. A., Miller, J. J., Owen, P. N., & Caron, M. E. G. (2018). Determining sources of fine-grained sediment for a reach of the Lower Little Bow River, Alberta, using a colour-based sediment fingerprinting approach. *Can. J. Soil Sci.*, 98, 55–69.
- Lloyd, C. E. M., Freer, J. E., Johnes, P. J., & Collins, A. L. (2016). Using hysteresis analysis of high-resolution water quality monitoring data, including uncertainty, to infer controls on nutrient and sediment transfer in catchments. *Science of the Total Environment*, 543, 388–404.
- London Sustainable Development Commission. (2004). *2004 report on London's quality of life indicators*. London: Greater London Authority City Hall.
- Longobardi, A., & Villani, P. (2009). Trend analysis of annual and seasonal rainfall time series in the Mediterranean area. *International Journal of Climatology*, doi:10.1002/joc.2001
- Luo, Y., Liu, S., Fu, S., Liu, J., Wang, G., & Zhou, G. (2008). Trends of precipitation in Beijiang river basin, Guangdong Province, China. *Hydrological Processes*, 22, 2377–2386.
- M. Shah, A. K. (2008). Disaster preparedness for sustainable development in Bangladesh. *Disaster Prevention and Management: An International Journal*, 17(5), 662–671.

- Maarten van Aalst. (2006). The impacts of climate change on the risk of natural disasters. *Disasters*, 30(1), 5-18.
- Mackay, A. K., & Taylor, M. P. (2013). Floodwater metal contaminants in an Australian Dryland River: A baseline for assessing change downstream of a major lead-zinc-silver and copper mine. *Journal of Environmental Quality*, 42(2), 474-483.
- Maharromiyati & Suyahmo. (2017). Pewarisan nilai falsafah budaya lokal Gusjigang sebagai modal sosial di Pondok Pesantren Entrepreneur Al Mawaddah Kudus. *Journal of Educational Social Studies*, 5(2 SE-Articles). Retrieved from <https://journal.unnes.ac.id/sju/index.php/jess/article/view/14082>
- Malaysia. (2016). *Rancangan Malaysia ke-11 (2016-2020)*. Putrajaya: Unit Perancang Ekonomi, Jabatan Perdana Menteri. (In Malay)
- Malaysia Automotive Association. (2019). *Market review 1st half 2019 Compared to 1st half 2018*. Malaysian Automotive association. Retrieved from <http://www.maa.org.my/statistics.html>
- Marfai, A. M. (2012). *Pengantar etika lingkungan dan kearifan lokal*. Yogyakarta: Gadjah Mada University Press.
- Mungmachon, M. R. (2012). Knowledge and local wisdom: Community treasure. *International Journal of Humanities and Social Science*, 2(13), 174–181.
- Margaret, O. M. (2014). The menace of the recent flood on water quality and rural people in Bayelsa State. *Brazilian Research Journal of Humanities, Social and Management Sciences*, 7(1), 22-33.
- Maria, G. H., Manuel, D. L. C. V., & Claudia, Y. (2017). Cultural heritage and urban tourism: Historic city centres under pressure. *Sustainability*, 9, 1-19.
- Marlena, B., Budi, S., & Sutrisnanto, D. (2012). Kajian pengelolaan sub DAS Garang Hulu terhadap kualitas air Sungai. In *Seminar Nasional Pengelolaan Sumberdaya Alam Dan Lingkungan*, September, 23–29. Retrieved from <http://eprints.undip.ac.id/37621/>

- Martini, S. D. R., & Tisngati, U. (2017). Kebudayaan lokal Pacitan: Analisis historis, nilai-nilai, dan sikap konservasi masyarakat. In *Seminar Nasional Hasil Penelitian Universitas Kanjuruhan Malang 2017*.
- Maryati, D., & Yanuardi. (2015). Pemberdayaan masyarakat dalam program pascatambang pasir besi oleh Pt Aneka Tambang di daerah Grabag, Purworejo. *Adinegara*, 5(5), 1–11.
- Maryono, A. (2014). *Menangani banjir, kekeringan, dan lingkungan*. Yogyakarta: Gadjah Mada University Press.
- Mawardi, M. (2012). *Rekayasa konservasi tanah dan air*. Yogyakarta: Bursa Ilmu.
- Mayes, R. L., Rittschof, K., Forrester, J. H., Christus, J. D. S., Watson, L., & Peterson, F. (2015). Quantitative reasoning in environmental science: Rasch measurement to support Q.R. assessment. *Numeracy Advancing Education in Quantitative Literacy*, 8(2), 1–31. Retrieved from <https://scholarcommons.usf.edu/cgi/viewcontent.cgi?referer=https://www.google.com/&httpsredir=1&article=1178&context=numeracy>
- Mayes, R. L., Peterson, F., & Bonilla, R. (2013). Quantitative reasoning learning progressions for environmental science: Developing a framework. *Numeracy Advancing Education in Quantitative Literacy*, 6(1), 1–28.
- McCluskey, J. (2001). Water supply, health and vulnerability in floods. *Waterlines*, 19(1), 14-17.
- Meadows, D. H., Meadows, D. L., Randers, J., & Behrens III, W. W. (1972). *The limit to growth*. New York: Universe Books.
- Melati, R.R., & Eko Sujatmiko (2012). *Kamus geografi*. Surakarta: Sarana Sinergi Media.
- Milliman, J. D., & Syvitski, J. P. M. (1992). Geomorphic/tectonic control of sediment discharge to the ocean: The importance of small mountainous rivers. *J. Geol.*, 100, 525-544.

- Ministry of Education Malaysia. (2013). *Malaysia Education Blueprint 2013-2025*. Retrieved from <https://www.moe.gov.my/menumedia/media-cetak/penerbitan/dasar/1207-malaysia-education-blueprint-2013-2025/file>
- Ministry of Education in Malaysia. (2010). *Numerasi Tahun 1-3*. Retrieved from <https://www.moe.gov.my/en/muat-turun/pendidikankhas/program-pemulihan-khas/muat-turun-ppk/set-instrumen-saringan-2-linus-2-0-tahun-2018/numerasi-tahun-1-3> (In Malay)
- Ministry of Energy, Green Technology & Water. (2009). *Dasar Teknologi Hijau*. Putrajaya: Kementerian Tenaga, Teknologi Hijau & Air Malaysia. (In Malay)
- Ministry of Natural Resource and Environment. (2003). *Keluasan kawasan banjir di Malaysia*. Retrieved March 3, 2016, from http://forum.mygeoportal.gov.my/smanre/sungai/kaw_banjir_msi (In Malay)
- Mmom, P. C., & Aifesehi, P. E. (2013). Impact of the 2012 flood on water quality and rural livelihood in the Orashi Province of the Niger Delta, Nigeria. *Journal of Geography and Geology*, 5(3), 216-225.
- Mohamed Salleh, L. (2009). *Mobiliti komuniti tani*. In Yahaya Ibrahim (Ed.), *Komuniti, pembangunan dan transformasi*. Bangi. Penerbit Universiti Kebangsaan Malaysia. (In Malay)
- Mohamad Shuhaimi Othman, Eng, C. L., & Mushrifah Idris. (2006). Water quality changes in Chini Lake, Pahang, West Malaysia. *Environ Monit Assess*, 131, 279-292.
- Mohamad Suhaily Yusri Che Ngah. (2007). *Impact of landuse change on water yield and water quality in Peninsular Malaysia*. Ph.D. Thesis, Department of Geography, Loughborough University.
- Mohamad Suhaily Yusri, C. N, Mohmadisa, H., Nasir, N., Yazid, S., & Zahid M. S. (2014). Analisis guna tanah dan implikasinya terhadap persekitaran fizikal lembangan Sungai Bernam 1984-2004. *Perspektif: Jurnal Sains Sosial dan Kemanusiaan*, 6(1), 19-35. (In Malay)

- Mohd Azlan, A. (2009). Kesan awal pembinaan projek hidro elektrik Bakun. In Yahaya Ibrahim (Ed.), *Komuniti, pembangunan dan transformasi*. Bangi. Penerbit Universiti Kebangsaan Malaysia. (In Malay)
- Mohd, F., Arieff, R., Salwa, Mat, S. H., & Ubaidah, T. (2013). Green technology management in the Muslim world. *Jurnal Teknologi, 1*, 107–115.
- Mohd Raihan Taha, Che Aziz Ali, Shaharudin Idrus, Ahmad Fariz Mohamed, Sarah Aziz, & Abdul Samad Hadi (Eds.). (2018). *Membuayakan kelestarian: Dua dasawarsa LESTARI di persada dunia*. Bangi: LESTARI, Universiti Kebangsaan Malaysia. Retrieved from <http://ukmpress.ukm.my> (In Malay)
- Mohd Yazid, M. T., & Zulkifli, M. U. (2015). The development of green management and green technology in green manufacturing in Malaysia. *Journal of Technology and Operations Management, 10*(1), 40-47.
- Molla, N. A., Sangsanont, J., Thayanukul, P., & Furumai, H. (2016). Proper dissemination of information to improve people awareness on flood disaster: A case study of 2011 flood in Thailand. *Applied Environmental Research, 38*(2), 1-12.
- Mulyadi. (2013). Logam berat Pb pada tanah sawah dan gabah di sub-das Juwana Jawa Tengah. *Agrologia, 2*(2), 95-101.
- Muta'ali, L. (2012). *Daya dukung lingkungan untuk perencanaan pengembangan wilayah*. Yogyakarta: Badan Penerbit Fakultas Geografi UGM.
- Nasir, N., Mohmadisa, H., Mohamad Suhaily Yusri, C. N., Kamarul, I., Yazid, S., & Nurhamizah, S. (2014). Determination of recreational lake water quality status boundary: A case study of E. coli in Taiping Lake Garden, Perak, Malaysia. *Australian Journal of Basic and Applied Sciences, 8*(23), 113-119.
- Nasir, N., Mohmadisa, H., Yazid, S., Kamarul, I., Hanifah, M., & Koh, L. S. (2016). Tahap kepekatan logam berat dalam tasik rekreasi di Taman Tasik Taiping, Perak. *Jurnal Geografi, 4*(2), 36-45. (In Malay)

- Nasser, N. (2003). Planning for urban heritage places: Reconciling conservation, tourism, and sustainable development. *Journal of Planning Literature*, 17(4), 467–479.
- National Numeracy. (2019). *Why is numeracy important?* Retrieved from National Numeracy website: <https://www.nationalnumeracy.org.uk/why-numeracy-important>
- No Name. (nd). *Hidrologi: Sungai dan Daerah Aliran Sungai*. Download from <https://ocw.upj.ac.id/files/Slide-TSP210-P2-Hidrologi.pdf>.
- Norilawati, M. N., & Yahaya, I. (2009). Pembangunan industri petroleum dan perubahan ekonomi tempatan. In Yahaya Ibrahim (Ed.), *Komuniti, pembangunan dan transformasi*. Bangi. Penerbit Universiti Kebangsaan Malaysia. (In Malay)
- Nor Eliza, A., Hazim, M., Wan, Y. C., & Zulkifli, Y. (2016). Rainfall analysis of the Kelantan Big Yellow Flood 2014. *Jurnal Teknologi*, 78(9-4), 83-90.
- Norizan, H., Hussin, S., & Hasimah, A. R. (2017). Peranan aplikasi teknologi hijau dalam konteks melestarikan alam sekitar menurut perspektif Islam. *E-jurnal Penyelidikan dan Inovasi*, 4(1), 1-12. (In Malay)
- Novotny, V. (2003). *Water quality: Diffuse pollution and watershed management* (2nd ed.). New York: John Wiley & Sons.
- Ntanos, S., Kyriakopoulos, G.L., Palios, V., & Chalikias, M. (2018). Environmental behavior of secondary education students: A case study at Central Greece. *Sustainability*, 10, 1-22.
- Nurain, M., & Ang, K. H. (2015). Kualiti air Sungai UTM: Satu penilaian awal berpandukan enam parameter Indeks Kualiti Air. *Geografia - Malaysian Journal of Society and Space*, 11(1), 107-115. (In Malay)
- O’Connell, P. (1990). *Policy development for low-input sustainable agriculture program*. Iowa, USA: SCS AnKeney.
- Office of the Deputy Prime Minister. (2003). *Sustainable communities: Building for the future*. London, UK: Office of the Deputy Prime Minister.

- Olaf, B., Dagmar, H., & Karsten, G. (2012). Ecosystem properties, potentials and services - The EPPS conceptual framework and an urban application example. *Ecological Indicators*, 21, 7–16. <https://doi.org/10.1016/j.ecolind.2011.03.014>
- Ooi, K. G. (2012). *Warisan wilayah utara Semenanjung Malaysia*. Pulau Pinang: Universiti Sains Malaysia. (In Malay)
- Orbasli, A. (2002). *Tourists in historic towns: Urban conservation and heritage management*. New York: Taylor & Francis.
- Owa, F. W. (2014). Water pollution: Source, effects, control and management. *International Letters of Natural Sciences*, 8, 1-6.
- Paimin, Irfan Budi Pramono, Purwanto, & Dewi Retno Indarwati. (2012). *Sistem perencanaan daerah aliran sungai*. Bogor: Kementerian Kehutanan BP2K P3KR.
- Pardue, J. H., Moe, W. M., Mcinnis, D., Thibodeaux, L. J., Valsaraj, K. T., Maciasz, E., & Yuan, Q. Z. (2005). Chemical and microbiological parameters in New Orleans floodwater following Hurricane Katrina. *Environmental Science & Technology*, 39(22), 8591-8599.
- Parker, D. J., & Thompson, P. M. (2000). Floods in Africa: Vulnerability, impacts and mitigation. In J. Parker (Ed.), *flood* (pp. 188–203). London: Routledge.
- Parsons, A. J. & Cooper, J. (2015). What is suspended sediment. *Earth Surface Processes and Landforms*, 40(10), 1417-1420.
- Patrick, T. H. C., Joy, J. P., Shaharudin, I., & Abdul Samad, H. (2006). *Tracking sustainability: Bandar lestari*. Environment Award. Bangi: LESTARI UKM.
- Pellicciotti, F., Burlando, P., & Vilet, K. V. (2007). Recent trends in precipitation and streamflow in Aconcagua River basin, central Chile. In *Glacier mass balance changes and meltwater discharge* (selected papers from sessions at the IAHS Assembly in Foz do Iguacu, Brazil, 2005), IAHS Publ. 318, 17-38.

- Perez, A., Melinon, P., Dupuis, V., Jensen, P., Prevel, B., Tuailon, J., & Pellarin, M. (1997). Cluster assembled materials: A novel class of nanostructured solids with original structures and properties. *Journal of Physics D: Applied Physics*, 30(5), 709.
- Pesuruhjaya Penyemak Undang-Undang. (2006). *Akta Bahasa Kebangsaan 1963/67*. (In Malay)
- Peterson, J. P. (1997). Indicators of sustainable development in industrializing countries. In *Management response strategies*. Bangi: LESTARI UKM.
- Pierre, L., & Louis, L. (2012). *Numerical ecology*. Oxford, United Kingdom: Elsevier Science & Technology.
- Population Reference Bureau. (2015). *World population data sheet*. Washington DC. Retrieved from <https://www.prb.org/2015-world-population-data-sheet/>
- Priest, T. (2013). *Maths vs numeracy*. Retrieved from <https://prezi.com/eq3vcugoln64/maths-v-numeracy/>
- Purwadi, F. S. H., & Tjaturahono, B. S. (2008). *Pengantar interpretasi citra penginderaan jauh*. Kerjasama Pusat Data Penginderaan Jauh LAPAN dan Jurusan Geografi UNNES.
- Puvasvaran, A. P., Miza Farhana, Y. Z., Zaid Ahmaed Al-Hayali, & Mukhiffun, M. (2012). Sustainability of green technology in Malaysia industry. *The paper presented at The International Conference on Design and Concurrent Engineering, 15-16 October*.
- Quarantelli, E. L. (1998). *What is a disaster?* London: Routledge.
- Radziejewski, M., & Kundzewicz, Z. W. (2004). Detectability of changes in hydrological records. *Hydrological Sciences Journal*, 49(1), 39-51.
- Rahman, M., Rahman, M., & Hossain, D. (2002). Assessment of water quality in flood-affected areas of Dhaka City. In M. A. Ali, S. M. Seraj, & S. Ahmad (Eds.), *Engineering Concern of Flood* (pp. 35-46). Dhaka, India: Bangladesh University of Engineering and Technology.

- Rees, W. E. R. (1996). *Our ecological footprint: Reducing human impact on the earth*. Canada: New Society Publishers.
- Rehman, S. (2009). Temperature and rainfall variation over Dhahran, Saudi Arabia, (1970–2006). *International Journal of Climatology*, 30(3), 445-449.
- Reseda, A. (2012). *Kajian efektifitas pengendalian banjir di DAS Garang*. Universitas Diponegoro. Retrieved from http://eprints.undip.ac.id/36553/1/Tesis_Arbor_Reseda.pdf
- Richard, R. H. (1990). *A history of sustainable agriculture*. Iowa, USA: SCS Ankeny.
- Rochgiyanti. (2011). Fungsi sungai bagi masyarakat di tepian Sungai Kuin Kota Banjarmasin. *Jurnal Komunitas*, 3(1), 51–59. Retrieved from <https://doi.org/https://doi.org/10.15294/komunitas.v3i1.2293>
- Rodale, R. (1983). Breaking new ground: The search for sustainable agriculture. *The Futurist*, 1(1), 15-20.
- Rodwell, D. (2011). Theory and practice in sustainable urban development. *Historic Environment*, 23(1), 8-14.
- Rofifei, R., Norngainy, M. T., Kamarul, A. K., & Adi, I. C. (2016). Understanding the people's needs of living in city: Scenario in malaysia. *Journal of Engineering Science and Technology*, 11(5), 704–713.
- Roland, N., Pierre, G., & Claudia, B. (2016). Reduction of disparities in access to green spaces: Their geographic insertion and recreational functions matter. *Applied Geography*, 66, 35–51. <https://doi.org/10.1016/j.apgeog.2015.11.008>
- Romadhon, D. R. (2013). *Menelisik nilai-nilai kearifan lokal dalam upacara tradisi Larung Sesaji di Telaga Sarangan Desa Sarangan Kecamatan Plaosan Kabupaten Magetan*. Universitas Negeri Malang. Retrieved from <http://jurnal-online.um.ac.id/data/artikel/artikel6DF2884A66B86431B54BF5FAD026B62B.pdf>

- Rosmin, T. (2007). *Pembangunan pusat perkhidmatan hierarki rendah: Kes Pusat Pertumbuhan Desa (PPD), di negeri Kedah, Malaysia*. PhD Thesis., Fakulti Sains Sosial dan Kemanusiaan, Universiti Kebangsaan Malaysia. (In Malay)
- Runnalls, C. (2007). *Choreographing community sustainability: The importance of cultural planning to community viability*. Simon Fraser University, British Columbia, Canada: Centre of Expertise on Culture and Communities.
- Rusdiana. (2014). *LP2B Dinas Pertanian Kota Semarang*. Semarang.
- Ruzian, M., & Norizan, H. (2014). Kelestarian alam sekitar dan pembiayaan teknologi hijau dari segi perspektif undang-undang Syariah. *Jurnal Kanun*, 26(2), 268-287. (In Malay)
- Saeed, T. U., & Attaullah, H. (2014). Impact of extreme floods on groundwater quality (in Pakistan). *British Journal of Environment & Climate Change*, 4(1), 133-151.
- Safitri, A. R., Deviar, A., Suharyanto, & Adi, R. Y. (2017). Kajian penanganan banjir sungai Tuntang di Desa Pulosari Kabupaten Demak. *Jurnal Karya Teknik Sipil*, 6(4), 345-356.
- Sakernas. (2018). Survey Angkatan Kerja Nasional 2017. Retrieved from <https://mikrodata.bps.go.id/mikrodata/index.php/catalog/SAKERNAS>.
- Salikin, K. A. (2003). *Sistem pertanian berkelanjutan*. Jakarta: Penerbit Kanisius.
- Salvatore, C. L. (Ed.). (2018). *Cultural heritage care and management: Theory and practice*. Maryland: Rowman & Littlefield.
- Sanjoto, T. B., & Wahid Akhsin B. N. (2019). *Prediksi perkembangan lahan terbangun pada daerah tangkapan air Rawapening berdasarkan Cellular Automata Modelling menggunakan citra penginderaan jauh*. Laporan Penelitian LP2M UNNES (unpublished).
- Satterthwaite, D. (2016). A new urban agenda? *Environment and Urbanization*, 28(1), 3–12.

- Schumm, S. A. (1977). *The fluvial system*. New York: John Wiley and Sons.
- Sedyawati, E. (2006). *Budaya Indonesia (Kajian arkeologi, seni, dan sejarah)*. Jakarta: PT.Raja Grafindo Persada.
- Setyawan, Y. A. (2019). *Persepsi dan partisipasi petani tambak dalam pelestarian lingkungan kawasan pesisir Desa Ketawangrejo Kecamatan Grabag Kabupaten Purworejo*. Skripsi UNNES. Retrieved from <https://lib.unnes.ac.id/34089/1/3201414040maria.pdf>
- Setyowati, D. L., Hardati, P., & Aرسال, T. (2018). Konservasi sungai berbasis masyarakat di Desa Lerep DAS Garang Hulu. In *Prosiding Seminar Nasional Geografi UMS IX 2018* (pp 401-410). Retrieved from <https://publikasiilmiah.ums.ac.id/handle/11617/10380>
- Setyowati, D. L., & Erni Suharini. (2014). *DAS Garang Hulu: Tata air, erosi, dan konservasi*. Yogyakarta: Penerbit Ombak.
- Setyowati, D. L., Aرسال, T., Hardati, P., Suroso, & Prabowo, K. Z. (2019). Morphoconservation analysis on Kali Garang as a river conservation effort. *IOP Conference Series: Earth and Environmental Science*, 243, 12007. Retrieved from <https://doi.org/10.1088/1755-1315/243/1/012007>
- Setyowati, D. L., Kariada, N., & Rusilowati, A. (2012). *Learning model for community based disaster mitigation in disaster-prone areas in Central Java*. Research results are not published. Semarang: LP2M. UNNES.
- Seputar Semarang.com. (2021). *Kampung Seni Lerep*. <http://seputarsemarang.com/kampung-seni-lerep/>.
- Shamshad, A., Seiong, N. P., Azhari, M. N. A., Isa, M. H., Sanusi S. A., & Wan Hussin W. M. A. (2006). Evaluate of the relationship between land use and surface water quality in Seberang Perai Selatan, Penang Malaysia. In *International Conference on Environment 2006 (ICENV 2006)*. 13-15 November 2006, Penang, Malaysia.

- Shamsul, A. B. (1996). Nations-of-Intent in Malaysia. In S. Tonnesson & H. Antlov (Eds.), *Asian forms of the nation* (pp. 323–347). London: Cruzor.
- Shimi, A. C., Parvin, G., Biswas, C., & Shaw, R. (2010). Impact and adaptation to flood: A focus on water supply, sanitation and health problems of rural community in Bangladesh. *Disaster Prevention and Management: An International Journal*, 19(3), 298–313.
- Shuko Hamada, & Takeshi Ohta. (2010). Seasonal variations in the cooling effect of urban green areas on surrounding urban areas. *Urban Forestry and Urban Greening*, 9(1), 15–24. <https://doi.org/10.1016/j.ufug.2009.10.002>
- Silva, P. L., Santos, J. F., & Vieira, I. (2014.) Teaching accounting and management through business simulation: A case study. In *Green Technology Applications for Enterprise and Academic Innovation*, 1, 33–47. UK: University of Bedfordshire.
- Siti Sofia, M. N. (2019, January). Penang Mufti wants state government resolve cross issues. *New Straits Times*.
- Sitorus, S. R. P. (2017). *Perencanaan penggunaan lahan*. Bogor: IPB Press.
- Smukler, S. M., Jackson, L. E., O’Geen, A. T., & Ferris, H. (2012). Environmental tradeoff assessment for best management practices on an organic farm in a Mediterranean-type climate. *Journal of Soil and Water Conservation*, 67, 16-31.
- Soetanto, R., & Proverbs, D. G. (2004). Impact of flood characteristics on damage caused to UK domestic properties: The perceptions of building surveyors. *Structural Survey*, 22(2), 95-104.
- Soler, M., Latron, J., & Gallart, F. (2008). Relationships between suspended sediment concentrations and discharge in two small research basins in a mountainous Mediterranean area (Vallcebre, Eastern Pyrenees). *Geomorphology*, 98(1–2), 143–152.

- Sreeramana, A., & Shubhrajyotsna, A. (2016). Nanotechnology innovations and commercialization – Opportunities, challenges & reasons for delay. *I.J. Engineering and Manufacturing*, 6, 16-25.
- Stafford, H. A. (1963). The functional bases of small towns. *Economic Geography*, 39(2), 165-175.
- Storlazzi, C. D., Norris, B. K., & Rosenberger, K. J. (2015). The influence of grain size, grain color, and suspended-sediment concentration on light attenuation: Why fine grained terrestrial sediment is bad for coral reef ecosystems. *Coral Reefs*, 34, 967-975.
- Street, B., & Baker, D. (2006). *So, what about multimodal numeracies*. In K. Pahl, & J. Rowsell (Eds.), *Travel notes from the new literacy studies*. Bristol: Multilingual Matters.
- Su, B. D., Jiang, T., & Jin, W. B. (2006). Recent trends in observed temperature and precipitation extremes in the Yangtze River basin, China. *Theoretical and Applied Climatology*, 83, 139-151.
- Sudanti. (2013). *Kajian jejak ekologi zona industri Genuk*. Disertasi DIL UNDP.
- Sudjarwa. (2004). *Buku pintar kependudukan*. Jakarta: Grasindo.
- Suhandini, P. (2010). *Banjir bandang di DAS Garang Jawa Tengah (Penyebab dan implikasinya)*. Disertasi Sekolah Pasca Sarjana UGM.
- Suhandini, P. (2012). *Banjir bandang di DAS Garang Jawa Tengah (Penyebab dan implikasi)*. Yogyakarta: Universitas Gadjah Mada.
- Sulong Mohamad. (1985). *Pembandaran dan persekitaran geografi fizikal bandar* (translate). Kuala Lumpur: Dewan Bahasa dan Pustaka. (In Malay)
- Suryana, A., & Adnyana, M. O. (1997). Pengembangan sistem usaha pertanian dalam era globalisasi ekonomi. In *Prosiding agribisnis dinamika sumberdaya dan pengembangan sistem usaha pertanian PSE, Bogor*.

- Susetyaningsih, A., Permana, S., Johari, G. J., & Chandrahadinata, D. (2019). Model of ecological approaches to build community response to flood disasters. *Journal of Physics: Conference Series*, 1402, 22012. Retrieved from <https://doi.org/10.1088/1742-6596/1402/2/022012>
- Sutomo. (2004). *Analisis data konversi lahan pertanian dan prediksi kebutuhan lahan*. IPB Bogor.
- Sutopo, P. N. (2002). Evaluasi dan analisis curah hujan sebagai faktor penyebab bencana banjir Jakarta. *Jurnal Sains & Teknologi Modifikasi Cuaca*, 3(2), 91-97.
- Suyatno, S. (2013). *Revitalisasi kearifan lokal sebagai upaya penguatan identitas keindonesiaan*. Retrieved from <http://badanbahasa.kemdikbud.go.id/>
- Syam, A. (2003). Sistem pengelolaan lahan kering di daerah aliran sungai bagian hulu. *Jurnal Litbang Pertanian*, 22(4), 162–171.
- Syarif, E., Sumarmi, Fatchan, A., & Astina, I. K. (2016). Integrasi nilai budaya Bugis Makassar dalam proses pembelajaran sebagai salah satu strategi menghadapi era masyarakat ekonomi ASEAN (MEA). *Jurnal Teori dan Praksis Pembelajaran Ilmu Pengetahuan Sosial*, 1(1), 13-21.
- Syed Zainol Abidin Idid. (1992). *Pemuliharaan warisan rupa bandar*. Kuala Lumpur: Perpustakaan Negara Malaysia. (In Malay)
- Syvitski, J. P. M., Vörösmarty, C. J., Kettner, A. J., & Green, P. (2005). Impact of humans on the flux of terrestrial sediment to the global coastal ocean. *Science*, 308, 376–380.
- Szabo, S., Hossain, M. S., Adger, W. N., Matthews, Z., Ahmed, S., Lázár, A. N., & Ahmad, S. (2016). Soil salinity, household wealth and food insecurity in tropical deltas: Evidence from south-west coast of Bangladesh. *Sustainability Science*, 11(3), 411–421.
- Tang, H. T., & Lee, Y. M. (2016). The making of sustainable urban development: A synthesis framework. *Sustainability*, 8(492), 1–28.

- Tawari-Fufeyin, P., Paul, M., & Godleads, A. O. (2015). Some aspects of a historic flooding in Nigeria and its effects on some Niger-Delta communities. *American Journal of Water Resources*, 3(1), 7-16.
- Taylor, L., & Hochuli, D. F. (2017). Defining greenspace: Multiple uses across multiple disciplines. *Landscape and Urban Planning*, 158, 25–38. <https://doi.org/10.1016/j.landurbplan.2016.09.024>
- Tew, K. H. (1999) *Production of Malaysia soil erodibility nomograph in relation to soil erosian issues*. Subang Jaya, Selangor: VT Soil Erosian.
- The Cockcroft Report. (1982). *Mathematics counts*. London: Her Majesty's Stationery Office.
- The United States Environmental Protection Agency. (1995). *A conceptual framework to support development and use of environmental information in decision-making*. Washington: USEPA.
- Thomas, R. B. (1985). Estimating total suspended sediment yield with probability sampling. *Water Resources Research*, 21(9), 1381-1388.
- Thorosby, D. (2016). Tourism, heritage and cultural sustainability: Three “golden rules”. In *Cultural tourism and sustainable local development* (pp. 31-48). New York: Routledge.
- Tipraqsa, P., Craswell, E. T., Noble, A. D., & Schmidt-Vogt, D. (2007). Resource integration for multiple benefits: Multifunctionality of integrated farming systems in Northeast Thailand. *Agric. Sys.*, 94, 694-703.
- Tobergte, D. R., & Curtis, S. (2013). Peranan media bagi memenuhi anjakan paradigma agenda teknologi hijau di Melaka. *Journal of Chemical Information and Modeling*, 53(9), 1689-1699. (In Malay)
- Toke, E. P., & Kathrine, L. V. (2013). Classification and valuation of urban green spaces-A hedonic house price valuation. *Landscape and Urban Planning*, 120, 119–128. <https://doi.org/10.1016/j.landurbplan.2013.08.009>

- Tolstykh, M. A., & Frolov, A. V. (2005). Some current problems in numerical weather prediction. *Fizika Atmosfery i Okeana*, 41(3), 315–327.
- Tuan Pah Rokiah, S. H., Abd Rahim, N. N., & Hamidi, I. (2014). The level of satisfaction towards flood management system in Kelantan, Malaysia. *Pertanika J. Soc. Sci. & Hum.*, 22(1), 257-269.
- Tuan Pah Rokiah, S. H., Baharum, M., & Hamidi, I. (2014). Kesiediaan kognitif menghadapi banjir bagi meminimumkan kemusnahan dan kehilangan nyawa. In *Prosiding PERKEM ke-9* (Vol. 9, pp. 851–858). Kuala Terengganu, Terengganu. (In Malay)
- Tuan Pah Rokiah, S. H., Hamidi, I., & Raman, M. (2011). Implikasi bencana banjir terhadap sosioekonomi penduduk Lembangan Kelantan. In *Persidangan Kebangsaan Ekonomi Malaysia Ke-6* (pp. 377–388). Melaka. (In Malay)
- Turner, R. E., & Rabalais N. N. (2003) Suspended sediment, C, N, P, and Si yield from the Mississippi River basin. *Journal of Hydrobiologia*, 511, 79-89.
- Tweed, C., & Sutherland, M. (2007). Built cultural heritage and sustainable urban development. *Landscape and Urban Planning*, 83(1), 62–69.
- Ubol. (2015). Proses belajar budaya melalui kearifan lokal: Studi kasus tentang pembelajaran orang dewasa dan seumur hidup di Thailand. *International Journal of Adult Vocational Education and Technology (IJAVET)*, 6(2), 41-60
- Ujianti, R., Anggoro, S., Bambang, A., & Purwanti, F. (2018). Water quality of the Garang River, Semarang, Central Java, Indonesia based on the Government Regulation Standard. *Journal of Physics: Conference Series*, 1025. Retrieved from <https://doi.org/10.1088/1742-6596/1025/1/012037>
- UNESCO. (2019). *20th anniversary of the UNESCO flagship programme: UNESCO Asia-Pacific Awards for cultural heritage conservation*. Retrieved from UNESCO website: <https://bangkok.unesco.org/content/20th-anniversary-unesco-flagship-programme-unesco-asia-pacific-awards-cultural-heritage>

- UNESCO. (2017). *Education for sustainable development goals. Learning objectives*. France: United Nations Educational, Scientific and Cultural Organization.
- UNESCO. (2011). *Preparing world heritage nomination* (2nd ed). Paris: UNESCO.
- UNESCO. (2006). *Education for all global monitoring report 2006: Understandings of literacy*. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000146186>
- UNESCO. (1990). *Literacy*. Retrieved from <https://en.unesco.org/themes/literacy>
- Unit Perancang Ekonomi. (2004). *Malaysian Quality of Life*. Kuala Lumpur: Unit Perancang Ekonomi, Jabatan Perdana Menteri.
- United Nations Human Settlements Programme. (2009). *Planning sustainable cities—Global report on human settlements 2009*. London, UK: Earthscan.
- United Nations Human Settlements Programme. (2012). *Urban patterns for a green economy leveraging density*. Nairobi, Kenya: UNON Publishing Services Section.
- United Nation. (1987). *Our Common Future - Bruntland Report*. Retrieved from <https://www.are.admin.ch/are/en/home.html>
- Van Oers, R., & Pereira Roders, A. (2012). Historic cities as model of sustainability. *Journal of Cultural Heritage Management and Sustainable Development*, 2(1), 4–14.
- Vink, A. P. A. (1975). *Land use in advance agriculture*. New York: Springer Verlag.
- Vitousek, P. M., Aber, J. D., Howard, R. W., Likens, G. E., Matson, P. A., Schlesinger, W. H., & Tilman D. G. (1997). Human alteration of the global nitrogen cycle: Source and consequences. *Ecological Application*, 7, 737-750.
- Vitousek, P. M., Whrlich, P. R., Ehrlich, A. H., & Marison, P. A. (1986). Human appropriation of the product photosynthesis. *Bioscience*, 34(6), 368-373.

- Wackernagel, M., & Yount, J. D. (1997) The ecological footprint: An indicator of progress toward regional stability. *Environmental Monitoring*, 51(1-2), 511-529.
- Wackernagel, M., & Rees, W. (1996). *Our ecological footprint*. Gabriola Island, BC: New Society Publishers.
- Wan Nur Tasnim, W. H., Nor Hidayati, Z., & Mohammad Nazir, A. (2015). Knowledge sharing and lesson learned from flood disaster: A case in Kelantan. *Journal of Information Systems Research and Innovation*, 9(2), 1–10.
- Wan Rozali Wan Hussin. (2002). Pertumbuhan bandar dan kualiti hidup sosial pada abad ke- 21. In Lukman Z. Muhamad, Abdul Aziz Jemain, Mohamad Yusof Hussain & Faridatul Azna A. Shahabuddin (Eds.), *Impak pembangunan kualiti hidup dan persekitaran*. Kuala Lumpur: Utusan Publications & Distributors Sdn. Bhd. (In Malay)
- Wan Ruslan Ismail. (1994). *Pengantar hidrologi*. Kuala Lumpur: Dewan Bahasa dan Pustaka. (In Malay)
- Wan Ruslan, I., & Sumayyah Aimi, M. N. (2011). Sediment and nutrient balance of Bukit Merah Reservoir, Perak (Malaysia). *Lakes and Reservoirs: Research and Management*, 16, 179-184.
- Wang, Q., Munoz-Carpena, R., Foster, A., & Migliaccio, K. W. (2011). Chapter 6: Groundwater sampling. In Y. Li & K. Migliaccio (Eds.), *Water quality concepts, sampling, and analyses* (pp. 73–91). United States: CRC Press.
- Wardani, D. W., Projo, D., & Bowo, S. (2016). Kajian perubahan penggunaan lahan berbasis citra satelit penginderaan jauh resolusi menengah dengan metode *Multi Layer Perceptron* dan *Marcov Chain*. *Majalah Geografi Indonesia*, 30(1), 9-18.
- Watson, A. (2013). *Reduce, reuse, recycle: Green technologies and practices at work*. Retrieved from https://www.bls.gov/opub/btn/volume-2/reduce-reuse-recycle-green-technologies-and-practices-at-work.htm?view_full

- Westwood, P. (2008). *What teachers need to know about teaching methods*. Camberwell: ACER Press.
- White, S. (2005). Sediment yield prediction and modelling. *Hydrological Processes*, 19, 3053-3057.
- Wiedmann, T., Barrett, J., & Lenzen, M. (2007). Companies on the scale - Comparing and benchmarking the footprints of Business. In *International Ecological Footprint Conference*. May 8-10, 2007, Cardiff, UK. Retrieved from http://www.brass.cf.ac.uk/uploads/Wiedmann_et_al_P36.pdf:http://www.isaresearch.co.uk/docs/Wiedmann_et_al_2007_Cardiff_Companies_EF.pdf
- Wijayanti, R. (2011). Studi identifikasi pengelolaan lahan berdasar Tingkat Bahaya Erosi (TBE) (Studi kasus di sub DAS Sani, DAS Juwana, Jawa Tengah). *Jurnal Ilmu Lingkungan*, 9(2), 57-61
- Willis, I. C. (2011). Rating curve. In Singh V.P., Singh P., & Haritashya U. K. (Eds.), *Encyclopedia of snow, ice and glaciers. Encyclopedia of Earth Sciences Series*. Dordrecht: Springer.
- Wilson, E. M. (1990). *Engineering hydrology*. Basingstoke: Macmillan.
- Wilson, E. M. (1992). *Hidrologi kejuruteraan* (translate). Sekudai: Unit Penerbitan Akademik, Universiti Teknologi Malaysia. (In Malay)
- World Health Organization. (2020). *Coronavirus disease (COVID-19) technical guidance: Essential resource planning*. Retrieved from <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/technical-guidance/covid-19-critical-items>
- World Health Organization. (2016). *Climate change and human health - Risks and responses*. Retrieved from <http://www.who.int/globalchange/summary/en/index7.html>
- Yanan, S., Fengyun, S., & Yue, C. (2017). Public green spaces and human wellbeing: Mapping the spatial inequity and mismatching status of public green space in the Central City of Shanghai. *Urban Forestry and Urban Greening*, 27(July), 59–68. <https://doi.org/10.1016/j.ufug.2017.06.018>

- Yang, Z., Sun, J., Zhang, Y., & Wang, Y. (2017). Green, green, it's green: A Triad Model of technology, culture, and innovation for corporate sustainability. *Sustainability*, 9(8), 1-23.
- Yang, S. L., Gao, A., Hotz, H. M., Zhu, J., Dai, S. B., & Li, M. (2005). Trends in annual discharge from the Yangtze River to the sea (1865-2004). *Hydrological Sciences Journal*, 50(5), 825-836.
- Yılmaz, K. T., Harmancı, D., Ünlükaplan, Y., Alphan, H., & Tezcan, L. (2018). Impacts of agriculture on coastal dunes and a proposal for adaptation to climate change: The case of the Akyatan area in the Seyhan Delta. In *Climate change impacts on basin agroecosystems* (pp. 165–182). Springer, Cham. Retrieved from https://link.springer.com/chapter/10.1007/978-3-030-01036-2_8
- Yue, S., Pilon, P., & Cavadias, G. (2002). Power of Mann-Kendall and Spearman's rho tests for detecting monotonic trends in hydrological series. *Journal of Hydrology*, 259, 254-271.
- Yue, S., Pilon, P., & Phinney, B. (2003). Canadian streamflow trend detection: Impacts of serial and cross-correlation. *Hydrological Sciences Journal*, 48(1), 51-63.
- Yulianti, J. S., & Burn, D. H. (1998). The impact of climate change on low streamflow in prairies region of Canada. *Canadian Water Resources Journal*, 23(1), 45-60.
- Yunus. (2010). *Metode penelitian wilayah kontemporer*. Yogyakarta: Pustaka Pelajar.
- Zainudin, A., Istiyanti, E., & Hasanah, U. (2012). Persepsi petani terhadap program pemberdayaan masyarakat di lahan bekas tambang pasir besi Desa Munggangsari Kecamatan Grabag Kabupaten Purworejo. *Surya Agritama : Jurnal Ilmu Pertanian dan Peternakan*, 1 (September), 68–77.
- Zhang, Q., Jiang, T., Gemmer, M., & Becker, S. (2005). Precipitation, temperature and runoff analysis from 1950 to 2002 in the Yangtze basin, China. *Hydrological Sciences Journal*, 50(1), 65-80.
- Zhang, X., Hogg, W.D., & Mekis, F. (2001). Spatial and temporal characteristics of heavy precipitation events over Canada. *Journal of Climate*, 14, 1923-1936.