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LEMBAR
HASIL PENILAIAN SEJAWAT SEBIDANG ATAU PEER REVIEW
KARYA ILMIAH: PROCEEDING

Judul Artikel Ilmiah	:	**Description of the Characteristics of Solid Medical Waste in the Environment During the COVID - 19 Pandemic: Case Study Hospital *X Covid-19 Referral in Semarang City***
Nama semua penulis	:	Nila Himayati, **Tri Joko**, Mursid Raharjo
Status Pengusul (coret yang tidak perlu)	:	~~Penulis Utama~~/ **PenulisAnggota**

Status Proceeding:

• Nama Proceeding/Seminar	:	2nd International Symposium of Earth, Energy, Environmental Science and Sustainable Development (JEESD 2021) 25th-26th September 2021
• Edisi (bulan, tahun)	:	Desember, 2021
• ISSN/ ISBN	:	P-ISSN:1755-1307; E-ISSN:1755-1315
• DOI	:	10.1088/1755-1315/940/1/012042
• Alamat WEB Proceeding	:	https://iopscience.iop.org/article/10.1088/1755-1315/940/1/012042

Dipresentasikan secara Oral dan dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar	[√]	Internasional Terindeks Scimago danScopus SJR 2020: 0.179
	[ ]	Internasional Terindeks pada SCOPUS, IEEE Elrplore, SPIEi
	[ ]	Internasional
	[ ]	~~Nasional~~

Dipresentasikan dengan Poster dan dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar	[ ]	Internasional
	[ ]	Nasional

Dipresentasikan tapi tidak dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar	[ ]	Internasional
	[ ]	~~Nasional~~

Hasil Penilaian Peer Review:

No	Komponen yang dinilai	Nilai Maksimal Artikel Prosiding Internasional Terindeks Scimago dan Scopus SJR 2020: 0.179	Nilai yang didapat artikel
a	Kelengkapan unsur isi artikel (10 %)	3	3
b	~~Ruang lingkup & kedalaman pembahasan (30 %)~~	~~9~~	~~8,5~~
c	Kecukupan dan kemutahiran data/informasi dan metodologi (30 %)	9	8,7
d	Kelengkapan unsur dan kualitas Proceeding (30%)	9	8,8
	Nilai Total	**30**	**29**
	Nilai yang didapat pengusul: 29 X0,4= 11,6 / 2 = 5,8		

Catatan Penilaian artikel oleh Reviewer

a	Kelengkapan unsur isi artikel	Artikel memenuhi komponen *abstract, introduction, method, result and discussion, conclusion, acknowledgements* dan *references* terkait karakteristik limbah medis padat selama pandemi Covid-19.
b	Ruang lingkup & kedalaman pembahasan	Ruang lingkup artikel sesuai dengan lingkup seminar, penulisan didukung dengan 15 referensi dan pembahasan cukup mendalam dengan 10 referensi pendukung.
c	Kecukupan dan kemutahiran data/informasi dan metodologi	Data/informasi yang digunakan muktahir dengan sebagian besar referensi terbit dalam 10 tahun terakhir. Metode yang digunakan sudah sesuai dan disebutkan dengan jelas
d	Kelengkapan unsur dan kualitas Proceeding	Prosiding diterbitkan oleh IOP Publishing yang terindex Scopus SJR: 0,179 dan P-ISSN:1755-1307; E-ISSN:1755-1315. Penomoran volume dan halaman, layout, serta referensi yang digunakan konsisten.

Semarang, 02 ~~Juni~~ 2022
Reviewer I

Dr. M. Zen Rahfiludin, SKM., M.Kes.
NIP. 197204201997021001
Unit Kerja : FKM Universitas Diponegoro
Jabatan : Lektor Kepala

LEMBAR
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• DOI	:	10.1088/1755-1315/940/1/012042
• Alamat WEB Proceeding	:	https://iopscience.iop.org/article/10.1088/1755-1315/940/1/012042

Dipresentasikan secara Oral dan dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar
- [√] Internasional Terindeks Scimago danScopus SJR 2020: 0.179
- [ ] Internasional Terindeks pada SCOPUS, IEEE Elrplore, SPIEi
- [ ] Internasional
- [ ] Nasional

Dipresentasikan dengan Poster dan dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar
- [ ] Internasional
- [ ] Nasional

Dipresentasikan tapi tidak dimuat dalam prosiding yang dipublikasikan (beri tanda √ yang sesuai)

Seminar
- [ ] Internasional
- [ ] Nasional

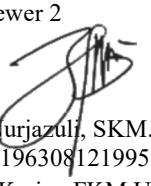
Hasil Penilaian Peer Review:

No	Komponen yang dinilai	Artikel Prosiding Internasional Terindeks Scopus SJR 2020: 0.179	Nilai yang didapat artikel
a	Kelengkapan unsur isi artikel (10 %)	3	2,5
b	Ruang lingkup & kedalaman pembahasan (30 %)	9	7,5
c	Kecukupan dan kemutahiran data/informasi dan metodologi (30 %)	9	7,5
d	Kelengkapan unsur dan kualitas Proceeding (30%)	9	7
	Nilai Total	**30**	24,5
	Nilai yang didapat pengusul: 24,5 X0,4= 9,4 / 2 = 4,9		

Catatan Penilaian artikel oleh Reviewer

a	Kelengkapan unsur isi artikel	Abstract, introduction, methods, Result and Discusion, Conclusion, acknowledgement, and References. Memenuhi Kaidah artikel ilmiah.
b	Ruang lingkup & kedalaman pembahasan	Artikel membahas pengelolaan limbah medis Covid 19 di rumah sakit. Artikel merupakan kajian sistematik. Artikel ini dipublish di Prociding Internasional terindek Scopus: IOP Conf. Ser.: Earth Environ. Sci. 940 012042. Isi Artikel relevan dengan scope prosing dan tema seminar tentang environment. Pembahsanan cukup mendalam dengan melakukan nalisis dan istensis yang dituangkan dalam tabel dan narasi.
c	Kecukupan dan kemutahiran data/informasi dan metodologi	Data hasil penelitian disajikan dalam tabel dan grafik, dan narasi yang informatif. Metode penelitian menggunakan pendekatan deskriptif. Pengumpulan data dilakukan dengan wawancara dan observasi, dan pengumpulan dat sekunder dari catatan medik.
d	Kelengkapan unsur dan kualitas Proceeding	Artikel diterbitkan di prosing internasional terindek scopus (IOP), ada DOI:10.1088/1755-1315/940/1/012042, ada corresponding author, ada penerbit, ada ISSN, tidak ada artikel history, ada volume dan nomer keberkalaan. Daftar fererensi, sebanyak lebih 15. Kualitas terbitan baik.

Semarang, 6 Juni 2022
Reviewer 2



Dr. Nurjazuli, SKM., M.Kes.
NIP. 196308121995121001
Unit Kerja : FKM Universitas Diponegoro
Jabatan : Lektor Kepala

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Description of the Characteristics of Solid Medical Waste in the Environment during the COVID - 19 Pandemic: Case Study Hospital X Covid-19 Referral in Semarang City

Himayati N. ; Joko T. ; Raharjo M.

Save all to author list

[a] Environmental Health, Faculty of Public Health Univeritas Diponegoro, Semarang, Indonesia

Abstract

Characteristics of Solid Medical Waste As long as the hospital as a health service provider is a source of solid medical waste generation. The current COVID-19 pandemic can potentially increase the number of medical waste generation in health care facilities. The COVID-19 pandemic has had an impact on changing the characteristics of the medical waste produced. This study describes the characteristics of hospital solid medical waste during the COVID-19 pandemic at the X Referral Covid Hospital in Semarang City. The study results show that the ratio of increasing solid medical waste during the 2020 pandemic ranges from 1.39 to 2.08 kg/bed/day. Handling medical waste in this condition is a challenge that needs to be appropriately managed. © Published under licence by IOP Publishing Ltd.

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Preface

To cite this article: 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **940** 011001

Preface

This year, Journal of Environmental Science and Sustainable Development (JESSD) is proud to hold its second international virtual symposium, featuring world-class speakers and editors worldwide. We were incredibly honored to have invited Prof. Christopher Silver, Ph.D., FAICP from College of Design, Construction, and Planning, University of Florida, Gainesville, Florida, USA; Mari E. Mulyani, D.Phil. from University of Oxford, Oxford, United Kingdom; Prof. Rotimi Williams Olatunji from School of Communication, Lagos State University, Nigeria; Prof. Svetlana Drobyazko from Open International University of Human Development, Kyiv, Ukraine; Prof. Marinela Panayotova from Departement. of Chemistry, University of Mining and Geology, Bulgaria; Anita Bernardus from APRIL Group; Ir. Maya Tamimi, M.Sc. from Unilever Indonesia; Dr. Yuki M. A. Wardhana from PT Penjaminan Infrastruktur Indonesia; and Dr. Taufan Madiasworo, ST, MT from Deputy Director of Integration on Settlements Infrastructure Management, Directorate General of Human Settlements, Ministry of Public Works and Housing.

The symposium was held in virtual format due to related restrictions during COVID-19 pandemic. I appreciate everyone's participation in the second JESSD Symposium: International Symposium of Earth, Energy, Environmental Science, and Sustainable Development, despite the restrictive situation caused by the global COVID-19 pandemic. Instead of being postponed, this symposium was conducted virtually to response to emerging issues mainly related to earth science, energy, environmental science, and sustainability. Moreover, this symposium also facilitates the publications of qualified research on COVID-19 to contribute to the global response towards the pandemic situation.

This symposium is slightly different with previous symposium and conference held last year. By making the best use of development in telecommunication platforms, we are able to gather virtually to share our insights and progresses covering numerous subjects ranging from: the broad earth science, energy, and environmental science, to more specific topics on Sustainable Development Goals (SDGs), and the special issues of COVID-19 Research as well as Community Engagement for Better Environment. This symposium utilized Zoom and Youtube, a widely known cloud-based video conferencing tool, as its telecommunication platform.

The symposium was held on 25-26 September 2021. Committees are based in School of Environmental Science, Universitas Indonesia, Jakarta, Indonesia. We are aware that a virtual setup will not provide the same experience as an on-site symposium. However, it is in our nature as researchers to be undeterred by new challenges. The opportunity to host this event virtually allows us to facilitate cross-borders discussion and collaboration at lower cost and less impact on the environment through reducing carbon footprint. We have invited some prominent speakers from various regions to provide lectures on a wide range of environmental researches. In addition, we have also invited world-class speakers and editors to help with your scientific publication process. The participants (presenters) are coming from 18 different countries all around the world, including: UEA, Bangladesh, Pakistan, Malaysia, Russia, Tajikistan, Vietnam, Japan, Thailand, Chile, India, Bulgaria, Nigeria, the United Kingdom, and Indonesian cities. Participant (presenter) numbers are 246.

We are glad that we received lots of submissions from the symposium and selected a bunch of high-quality papers and compiled them into the proceedings after reviewed them using the double-blind peer review procedure. The symposium is considered successful. Signal loss and some technical issues happened during parallel sessions but had been well and quickly addressed by technical assistants, without causing any significant delay. I express my deep gratitude to the editors: Editors committee: Dr. Ahyahudin Sodri, Dr. Herdis Herdiansyah; Prof. Shabbir H Gheewala, D. Eng; Mari E. Mulyani, D.Phil; Dr. Stefanie Steinebach; Prof. Dr. Ing. Ir. Misri Gozan, M.Tech; Prof. Dr. Djoni Hartono; Ratih Dyah Kusumastuti, Ph.D; Dr.rer.nat. Rino Rakhmata Mukti, S.Si., M.Si; Teguh Dartanto, Ph.D and Jamal Khatib, B.Eng., M.Eng.(Sc.), Ph.D and Committees: Dr. Herdis Herdiansyah (Chairman); Nur Muthi'ah R Ridwan, S.T.P; Arty Dwi Januasi, S.Si., M.Si; Azhari Ridha Darmawan S.Hut; Nadhilah Zhafirah, S.K.L; Akia Kevin Muliansyah Athallah; Adinda Afifah Damayanti; Hairunisa; Hendro Putra Johannes, M.Si; Nurul Rusdayanti, S.Si, M.Si and Azhar Firdaus, M.Si. for their time, hard work, and contribution to support this symposium during this challenging time.

I would like to take this opportunity also to express my gratitude for our sponsors, PT Riau Andalan Pulp and Paper (April Group), Induk Koperasi Kepolisian Negara Republik Indonesia (Inkopol), PT Arlindo Grafimedia, PT Unilever Indonesia Tbk., Bank BRI, PT Penjaminan Infrastruktur Indonesia, PT. Meares Soputan Mining, PT. Merdeka Copper Gold, and Greenera Consulting for conducting the joined session. Last but not the least, we send our sincere thanks to the IOP publisher for publishing the proceedings.

Jakarta, 25 September 2021
Editor-in-Chief,

Dr. Herdis Herdiansyah

Stefanie Steinebach
Georg-August-Universität Göttingen | GAUG · Institute for Social and Cultural Anthropology
PhD

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Stefanie Steinebach currently works at the Faculty of Ressource management, University of Applied Sciences, Göttingen. Stefanie does research in Conflict management, Forest use conflicts, ethnic diversity and Politics. Their former project is 'EFForTS'.

Skills and Expertise

Multiculturalism | Cultural Studies | Sociology | Culture | Social and Cultural Anthropology | Cultural Diversity | Ethnography | Social Anthropology | Social

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Farmers and Pawns: The Role of Migrants in Agrarian Conflicts and Rural Resistance in Sumatra, Indonesia

Article

May 2017

Stefanie Steinebach

Land grabbing in relation to boom-crop production or nature conservation triggers displacement and dispossession of local communities as well as rural resistance often culminating in violent conflicts over land. In Indonesia, company-initiated oil palm production on debatable territories also stimulates migration into these contested rural areas by...

View

'The fridge in the forest': Historical trajectories of land tenure regulations fostering landscape transformation in Jambi Province, Sumatra, Indonesia

Article

Apr 2017

Yvonne Kunz · Stefanie Steinebach · Christoph Dittrich · [...] · Heiko Faust

View

Separating sisters from brothers: Ethnic relations and identity politics in the context of indigenous land titling in Indonesia

Article Full-text available

Jan 2017

Stefanie Steinebach · Yvonne Kunz

Environmental and social transformations in Jambi province, Indonesia, are inextricably interlinked. Large-scale agro-industrial development and nature conservation policies equally alienate local communities from their agricultural lands and turn land into a scarce resource. Consequently, access to agricultural land becomes increasingly contested,...

View

Shabbir H. Gheewala
King Mongkut's University of Technology Thonburi | KMUTT · The Joint Graduate School of Energy and Environment
D.Eng. (Environmental Engineering)

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Skills and Expertise

Sustainability | Energy | Environment | Environmental Engineering | Renewable Energy | Biomass | Sustainable Development | Waste Management | Biot

litional affiliations

January 2015 - present
Asian Institute of Technology
Thailand
Position
Distinguished Adjunct Professor

January 2012 - present
University of North Carolina at Chapel Hill
Department of Environmental Sciences and Engineering · Chapel Hill, United States
Position
Professor (Associate)

March 2002 - present
King Mongkut's University of Technology Thonburi
The Joint Graduate School of Energy and Environment · Thon Buri, Thailand
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Paul R Jepson

ıtes one notable result that the REDD+ ('Reducing Emissions from Deforestation and and enhancing forest carbon stocks and conservation') initiative effected within ıstitutions. It argues that during its interplay with existing National forest institutions significant benefi...

Ahyahudin Sodri
University of Indonesia | UI · School of Environmental Science
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al Comfort-Based Spatial Planning Model in Jakarta Transit Oriented Development (TOD)

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022

yati Sari Hasibuan · Ahyahudin Sodri · Andhy Bato Raya

-oriented development (TOD) is integrated spatial planning and transportation that enhances walkability her green mobility. The issue of thermal comfort in walkability is a major concern in the TOD of cities in l climates such as Jakarta. This study aimed to model and compare microclimate conditions and thermal t between e...

ONMENTAL IMPACT OF CEMENT PRODUCTION ACTIVITIES IN BOOLANG REGENCY, GONDOW, NORTH SULAWESI

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m Akbar Mustafa · Hayati Sari Hasibuan · Ahyahudin Sodri

ment industry is a large industry that can have an impact on the surrounding environment. In the area of g Regency, Mongondow, North Sulawesi, there is a foreign cement industry that has only been

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2021

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Accepted papers received: 17 November 2021

Published online: 14 December 2021

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Preface

Earth Science

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Spatial Analysis of Universitas Indonesia (UI) Urban Forest Microclimate and Its Biodiversity

Z Nadia, S Warno and T Waryono

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Suitability of Post-Disaster Coastal Land Cover with Spatial Pattern Plan of Palu City

R R Wirawan, H S Hasibuan and R P Tambunan

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Mapping Environmental Impacts of Rapid Urbanisation and Deriving Relationship between NDVI, NDBI and Surface Temperature: A Case Study

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D J Sasangka

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Management of Village Treasury Land Based on Bamboo Agroforestry

E Fauziyah, T S Widyaningsih, D P Kuswantoro and Sanudin

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Forest Bathing: A New Attraction and Disaster Mitigation for Batur UNESCO Global Geopark Bali

E J Mihardja, D A P Sari, I D K K Widana, C Ridhani and I G W Suyasa

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Catchment Area of Park-and-Ride and Kiss-and-Ride nearby Citayam and Bojonggede Railway Station

M H Bassayev and W Sumadio

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Carbon Emissions from the Transportation Sector during the Covid-19 Pandemic in the Special Region of Yogyakarta, Indonesia

E Nurjani, K P Hafizha, D Purwanto, F Ulumia, M Widyastuti, A B Sekaranom and U Suarma

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Screening Extract EtOAc Sponge Derived Fungi Against Clinical *Staphylococcus aureus* to Obtain Sustainable Natural Product

R Lutfiah, N L G R Juliasih, J Hendri and A Setiawan

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Maintaining Environmental Sustainability through Existing Environment's Vegetations

M R Nugraha and O C Dewi

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Watershed Health Changes based on Vegetated Land Cover in the Upper Citarum Watershed, West Java, Province, Indonesia

K Marko, D Sutjiningsih and E Kusratmoko

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Estrogenic Waste Conservation in Bengawan Solo Sub-Watershed: Application of Contingent Valuation Method

S Khoiriyah, Suranto, P Setyono and E Gravitiani

Analysis of Disaster Mitigation in Carita with Environmental Learning in Elementary School

H Rahmayanti[1*], T E B Soesilo[2], D A P Sari[2], I Z Ichsan[3], E Kurniawan[4], Titin[5], Dasmo[6], F M Hermawati[6], C K S Singh[7], D V Rogayan Jr[8], and Md M Rahman[9]

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[2] School of Environmental Science, Universitas Indonesia, Indonesia
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[4] Geography Education Program, Universitas Negeri Semarang, Indonesia
[5] Biology Education Program, Universitas Tanjungpura, Indonesia
[6] Physics Education Program, Universitas Indraprasta PGRI, Indonesia
[7] Department of English Language and Literature, Universiti Pendidikan Sultan Idris, Malaysia
[8] College of Teacher Education, President Ramon Magsaysay State University, Philippines
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Abstract. This study analyzes the profile of Carita people in the efforts of tsunami disaster mitigation and the role of environmental learning in coping with the disaster, then analyzes the use of environmental learning. The method used is a mixed method of qualitative and quantitative methods. The quantitative method measures various community readiness levels in performing disaster mitigation, whereas the qualitative method is utilized to obtain various further information from the communities using interview technique. There were 88 randomly selected respondents participating in this research. The study results indicate a low land utilization density (below 33%). Indicators suggest a good category, namely: people evacuate when a disaster occurs (86%), rescue during a disaster (96.59%), and try to find new livelihoods (82.95%). In addition, public knowledge of disaster evacuation route is at a good level (87.50%) and there is an increase of 39.77% respondents with improved knowledge after the tsunami disaster occurred. Environmental learning, in this case, plays an important role to provide information to the public relating the efforts in disaster mitigation. The conclusion is that community's disaster mitigation readiness still requires some improvement through various efforts, one of them is environmental learning with learning media in elementary school.

1. Introduction

The combination of the number and the impact of geological disasters in Indonesia is closely related to the Indonesia's own geographical position. Geographically, Indonesia is located at the confluence of

Mapping Environmental Impacts of Rapid Urbanisation and Deriving Relationship between NDVI, NDBI and Surface Temperature: A Case Study

V Saini[1*]

[1] Indian Institute of Technology Ropar, Rupnagar, Punjab, 140001, India. ORCID ID: 0000-0002-8887-6941

[1*]varinder126@gmail.com

Abstract. Urbanisation is a complex global phenomenon driven by unorganised expansion, increased immigration, and population explosion. Changes in land cover are one of the most critical components for managing natural resources and monitoring environmental impacts in this context. In the present study, a hybrid classification approach was applied to Landsat data to get insight into the urbanisation of the Chandigarh capital region from 2000 to 2020. The results demonstrate an increasing urbanisation tendency on the city's outskirts, particularly in the north-western and southern directions. The most considerable alterations were seen in the class vegetation as it swiftly transformed to built-up regions. Two indices, namely NDVI and NDBI and surface temperature images, were also derived from studying their inter-relationships. The paper suggests a positive linear relationship between surface temperature and NDBI while a negative correlation between NDVI and NDBI. Such studies may help city planners to take timely and appropriate efforts to reduce the environmental consequences of urbanisation.

1. Introduction

Urbanisation is popularly defined as the increase in the population of urban areas. [1] defined urbanisation as follows, “Urbanisation is not a product. It is a process by which people, instead of living in predominantly dispersed agricultural villages, start living in towns and cities dominated by industrial and service functionaries. It involves multiplication of urban places and/ or an increase in size of cities."

The phenomenon of urbanisation is global. The current population of the world is 7.9 bn, and it has been predicted to increase to 8.5 billion by 2030 [2], out of which 5 bn people will be living in cities. India is not far behind in this global phenomenon. It has been projected that India will add 416 million urban dwellers by 2050 – the highest amongst all the countries [3]. An increase in urban areas leads to the development of built infrastructure, which traps the incoming solar radiation, the heat released from vehicular exhausts and other such sources, leading to the urban heat island effect. With its inherent ability of synoptic, periodic and cost-effective coverage, remote sensing is gaining popularity to study such an increase in urbanisation. Several authors [4–11] have reported the suitability of remote sensing data to map, monitor and detect changes associated with rapid urbanisation [12]. In the case of Chandigarh, the study area of this research, it is projected that by the year 2021, its population would be around 1.95 mn (at the current growth rate), almost four times for which it was initially built. Thus, the present study aims to map the environmental impacts of increasing urban areas in Chandigarh and its neighbouring cities over the past two decades using satellite data. A comparison between the surface

Practical Applications of Sustainability Science in Landscape Planning Preliminary Stage of Bunaken-Tangkoko-Minahasa Biosphere Reserve

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Abstract. Sustainability Science (SS) is important in resource management, however not always well translated into actions. This research aims to find and implement practical applications of SS in the preliminary stage of landscape planning in Bunaken-Tangkoko-Minahasa Biosphere Reserve (BTMBR). The researchers put both perception and role of all local parties from the problem definition stage in landscape planning into account. The primary data was collected by using questionnaires. The secondary data includes literature review of SS in landscape planning, BTMBR's characteristics, regulations and organizations. The researchers analyse landscape firstly by its 3-in-1-components namely space, environment, and human an later as unity. All parties consider watershed management as the entry point to sustainable and resilient landscape planning in this research case. The upstream part is perceived playing an important role, and because it is located in BTMBR core zone, this can be useful in future landscape management programs. The slope degree, which relates to watershed parts, is an important factor therefore landscape planning should consider different demand according to it. The Tondano Lake, as an important water element in BTMBR, do not have any conservation status. The researchers propose efforts to improve regulation and program including all local parties integration and involvement.

1. Introduction

United Nations Development Programme (UNDP) highlights that forest and desertification are still ongoing, with disparity influences between community groups. Moreover, biodiversity is still at risk. Urgent actions are needed to address environmental degradation and biodiversity loss [1]. In a landscape perspective, efforts can be made through sustainability science (SS) based-landscape planning with the target of sustainable and resilient landscape [2]. This is in line with SDGs No. 15 "Life on Land".

Influence of Sustainable Development of Space Activities on Earth Ecology

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Abstract. In the age of New Space, faces the global problem of orbit space constraint. Sustainable development of space activities will be possible only when space users implement technologies and practices suitable to avoid accumulating objects in orbit. Artificial debris in orbital space has reached catastrophic proportions. This harm the Earth's ecology leading to increased steps to transform a planet that is unsuitable for life. Based on the fractal analysis, the graphic interpretation of the components of SWOT-analysis of development of the rocket and space industry is built. It is found that the weak side and threat to the activities of the aerospace industry is the insufficient funding of implemented projects and inefficient distribution of finances between its components: science and production. It is proposed to use blockchain technology as an effective tool for the cybersecurity of space objects. The ecological risks from space activities that affect the Earth's ecology are analyzed. It is proven that the prevention of severe environmental consequences and minimization of the negative impact of the above threats require the introduction of environmental management systems in space activities.

1. Introduction

In order to increase the interest of stakeholders in space exploration and ensure the effectiveness of sustainable space activities programs, it is necessary to build the capacity of many countries in the sector of essential space technologies, ensure a responsible attitude to space of new space agents, raise public awareness and activism.

The increase in the number of countries and private operators operating space systems in geostationary orbit significantly highlights the long-term sustainability of space activities due to the increase in the population of orbital debris, especially in low Earth orbits, congestion of individual families of orbits, and various radio interference problems.

At all hierarchical levels of the economy (national and international), there is a corresponding list of standards and guidelines in the field of waste prevention and protection of spacecraft. Projects to prevent the formation or disposal of garbage require certain costs. To ensure the competitiveness of space activities, all agents (space users) must participate in these projects. Measures to prevent the formation of space debris will be effective only if it is an integral and permanent element of activity in orbit.

The problem of garbage generation and the protection of spacecraft is a component of international security. In determining the feasibility study of rocket and space technology projects, it is necessary to carry out a safety assessment, to determine the probability of collision of the payload with other active