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1. Developing circular cities in emerging economies: Investigating circular economy initiatives in the urban food system of two Indonesian cities / Pribadi, Didit Okta; Indraprahasta, Galuh Syahbana; Aziz, Subkhi Abdul; Farandy, Alan Ray; Hidayatina, Achsanah; Rosandi, Vely Brian. Cities1. ISSN: 0264-2751 (2025) v.160 Issue. p.105816. 160

Url: https://www.sciencedirect.com/science/article/pii/S0264275125001167

DOI: 10.1016/j.cities.2025.105816

Abstract: Cities have become the epicenter of global population and economic agglomerations that significantly consume resources, produce global waste, and release greenhouse gas emissions. Linear economy practices constrain efforts to reach urban sustainability; therefore, a circular city concept has emerged. The question of whether to confine circularity within the city limits or to extend it across diverse territorial boundaries is a subject of ongoing debate. This study aims to contribute to this discourse by examining circular economy initiatives in the urban food system in two Indonesian cities, namely Semarang and Surabaya. Policy documents, networks of actors, motives of circular economy initiatives, and profiles of circular economy businesses were analyzed. The results show that Semarang has a more supportive regulatory framework and a compact network of actors than Surabaya. The paper posits that the territorialization of food circularity cannot be confined to the city limits, as it involves transboundary actors. Still, the city government plays an instrumental role in facilitating the flourishing circular food system, including a conducive environment for community and economic actors to engage with networks beyond the city's jurisdiction. In both cities, circular food initiatives were mainly driven by social and environmental considerations; however, ensuring financial sustainability remained crucial.

Keyword: Indonesia; Circular city; Circular economy; Motives of actors; Social network; Urban food system

2. Rising real wages, mechanization and growing advantage of large farms: Evidence from Indonesia / Yamauchi, Futoshi. Food Policy2. ISSN: 0306-9192 (2016) v.58 Issue. p.62-69. 58

Url: https://www.sciencedirect.com/science/article/pii/S0306919215001360

DOI: 10.1016/j.foodpol.2015.11.004

Abstract: This paper examines dynamic patterns of land use, capital investments and wages in agriculture using farm panel data from Indonesia. The empirical analysis shows that with an increase in real wages that prevailed in both agricultural and non-agricultural sectors in rural areas, relatively larger farmers increased the size of operational farm land by renting in land as well as used more hired-in machines through machine rental and/or service providers, which induces the substitution of labor by machines. Machines and land are complementary and, consistently, the inverse farm size-productivity relationship tends to be reversed among relatively large holders. The results support growing (diminishing) advantage of large (small) farms in the presence of rapidly rising real wages and have food security policy implications to many Asian countries where real wages are rapidly rising and small farms are predominant.

Keyword: Indonesia; Farm size; Mechanization; Wage growth

3. Indonesian policy and researches toward 70% reduction of marine plastic pollution by 2025 / Arifin, Zainal; Falahudin, Dede; Saito, Hiroaki; Mintarsih, Tuti Hendrawati; Hafizt, Muhammad; Suteja, Yulianto. Marine Policy3. ISSN: 0308-597X (2023) v.155 Issue. p.105692. 155

Url: https://www.sciencedirect.com/science/article/pii/S0308597X23002191

DOI: 10.1016/j.marpol.2023.105692

Abstract: Marine plastic litter has become an emerging pollution issue in Indonesia. In this review, we examined policies related to plastic litter and their impact on reducing plastic litter in Indonesian seas and analyzed the progress in marine plastic research to contribute to the policy. Then, synthesized gaps to improve policy and possible scientific contributions to reduce marine plastic pollution. Our review showed that Indonesia's policy on reducing marine plastic litter pollution was largely focused on land-based sources, lack of sea-based leakage, and limited community behavior change in plastic use. Most research was done in the central region of Indonesia where a hotspot of marine plastic pollution occurred, and understudied in western and eastern regions. The national policy to reduce 70% of marine plastic litter entering the Indonesian seas by 2025 requires an extended period. The active role of local governments, improvement of solid waste management information system, and establishment of a marine plastic research agenda are among the most crucial for achieving national targets.

Keyword: Indonesia; Bioplastics; Marine litter; Plastic pollution; Plastic regulations

4. Should Developed Regions Bear More Responsibility in Addressing Environmental Issues? Insights from Indonesia's Unequal Regional Development / Muhammad, Fikri; Hartono, Djoni; Hastuti, Sasmita Hastri; Patunru, Arianto A.; Balya, Audhi Ahmad. Energy Nexus4. ISSN: 2772-4271 (2025) v.17 Issue. p.100334. 17

Url: https://www.sciencedirect.com/science/article/pii/S2772427124000652

DOI: 10.1016/j.nexus.2024.100334

Abstract: Addressing environmental issues is inherently complex due to the fundamental question of who bears responsibility. While more prominent at the global level, this issue is also pertinent on a subnational level, such as in Indonesia, where significant disparities exist in economic development and environmental degradation across the archipelago. Our research intends to fill the gap by measuring environmental footprints in the country while accounting for the interregional trade between provinces. We utilize the Environmentally-Extended Interregional Input-Output (EE IRIO), which allows us to evaluate the relationship between economic activities, environmental footprints, and corresponding spatial distribution. The study reveals that Indonesia's carbon and water footprints are primarily consumed and produced on Java Island, whereas the agricultural footprint is produced on Sumatra and Kalimantan Islands but consumed significantly on Java Island. This result corresponds with Java Island's dominance in terms of the economy and population. The study revealed that developed regions produce footprints directly and induce footprint generation in other areas through import demand, emphasizing the relevance of ‘common but differentiated responsibility’ in local development.

Keyword: consumer vs. producer; environmental footprints; environmental responsibility; footprints; interregional input-output analysis

5. Poverty reduction saves forests sustainably: Lessons for deforestation policies / Miyamoto, Motoe. World Development5. ISSN: 0305-750X (2020) v.127 Issue. p.104746. 127

Url: https://www.sciencedirect.com/science/article/pii/S0305750X1930395X

DOI: 10.1016/j.worlddev.2019.104746

Abstract: Efforts to reduce deforestation are increasing worldwide through the implementation of climate change mitigation schemes and have recently been promoted as one of the goals of the United Nations' 2015–2030 Sustainable Development Goals. However, existing strategies are associated with high costs, low effectiveness, and potential adverse economic impact on tropical countries and local people. Moreover, because the underlying causes of deforestation are not clearly understood, the policy options that would be most effective in halting deforestation are not known. Therefore, in this study, I examine the main factors influencing forest area change by synthesizing the results of a multinational data analysis, a Malaysian socio-economic survey, and Indonesian household surveys on deforestation that were conducted between 1990 and 2014. I reveal that poverty has a strong impact on forest area change and that high agricultural rent accelerates deforestation. I then use logical equations based on my own findings and those of previous studies to represent the relationships between deforestation, poverty, agricultural rent, and forest scarcity. From these equations, I derive clear and reasonable explanations for the causes of deforestation and assess the effectiveness of various policies and Reducing Emissions from Deforestation and Forest Degradation strategies to halt deforestation. I suggest that poverty-reduction strategies can represent sound and effective methods for reducing tropical deforestation. These findings will facilitate development of sustainable strategies that will both reduce deforestation over long term and reconcile forest conservation with social welfare.

Keyword: Agricultural rent; Climate change; Deforestation; Logical equations; Poverty reduction; REDD

6. Absolute and relative power gains among state agencies in forest-related land use politics: The Ministry of Forestry and its competitors in the REDD+ Programme and the One Map Policy in Indonesia / Wibowo, Agung; Giessen, Lukas. Land Use Policy6. ISSN: 0264-8377 (2015) v.49 Issue. p.131-141. 49

Url: https://www.sciencedirect.com/science/article/pii/S0264837715002276

DOI: 10.1016/j.landusepol.2015.07.018

Abstract: More than ever, state agencies responsible for forest issues are required to balance the social, economic and environmental demands on forests in domestic and international spheres. New and often cross-cutting issues may threaten the position and power of traditional forest bureaucracies through, e.g., a redistribution of power among a number of other land-use-related state agencies. This paper analyzes the absolute and relative power of the Ministry of Forestry (MoF) in two selected policy processes originating on the international and domestic levels, namely the REDD+ Programme and the

One Map Policy. Building on a behavioralist conception of power and bureaucratic politics theories, we study these processes to reveal the power dynamics between the MoF and other state bureaucracies, based mainly on documents on tasks assigned to these bureaucracies. Our results show a clear decline in the relative power of the MoF, most notably in the case of incentive and coercive power, though we also show a continuation of power resulting from dominant information. However, due to political intervention from the new president, traditional forest bureaucracy is now reclaiming most of relative power elements in these cases. We discuss the core findings and conclude that both REDD+ and the One Map Policy are likely to become effective policies only if the bureaucratic, sectoral and multi-level conflicts of interest we examine are addressed and fewer leading agencies (or one) assume responsibility for policy formulation and implementation.

Keyword: Bureaucratic politics; International influences; Norway–Indonesia LoI; Power theory; REDD+ Programme; The Ministry of Forestry

7. Agricultural trade liberalization, governance quality, and technical efficiency in the agricultural sector of Southeast Asia / Trakem, Veasna; Fan, Hongzhong. Heliyon7. ISSN: 2405-8440 (2024) v.10 Issue. 21p.e39553. 10

Url: https://www.sciencedirect.com/science/article/pii/S2405844024155843

DOI: 10.1016/j.heliyon.2024.e39553

Abstract: International trade has been regarded as an essential factor in enhancing a country's productivity and efficiency. Nevertheless, developing countries squander money and resources as a result of their deficient institutional quality, impeding their ability to profit from specialization and trade. Therefore, this study intends to investigate the impact of agricultural trade liberalization and governance quality on technical efficiency in Southeast Asia's agricultural sector using balanced panel data spanning from 2002 to 2021. The research utilizes translog stochastic frontier analysis (SFA) with a single-stage maximum likelihood estimation (MLE) to simultaneously calculate the time-varying technical efficiency scores and explore the core factors influencing agricultural inefficiency. The findings reveal that the average output-oriented technical efficiency for ASEAN-8 countries was 94 %. This suggests that there is significant potential to enhance technical efficiency in agricultural production by up to 6 % by addressing the adverse impacts of technical inefficiency. The research findings further point out that Malaysia is the most technically efficient country, having a technical efficiency score of 99.82 %, followed by Vietnam (99.75 %), Thailand (99.70 %), Lao PDR (98.90 %), Myanmar (95.42 %), Indonesia (91.64 %), the Philippines (90.65 %), and Cambodia (76.11 %). The results of disaggregated agricultural trade liberalization demonstrate a significant reduction in agricultural inefficiency in Southeast Asia through agricultural exports and imports. The findings also emphasize that improvements in the rule of law positively contribute to agricultural efficiency, whereas enhancements in terms of voice and accountability and regulatory quality appear to reduce it. Based on these findings, the government should consider enlarging open and liberalized trade policies in order to facilitate the exchange of technology and knowledge within the agriculture sector. Additionally, the government should involve farmers, agricultural cooperatives, local communities, and other relevant stakeholders in the decision-making process to ensure that policies address the specific needs and constraints faced by the sector.

Keyword: Agricultural technical efficiency; Agricultural trade liberalization; Governance quality; Single-stage maximum likelihood estimation; Southeast Asia; Translog stochastic frontier analysis

8. Progressive biodiesel policy in Indonesia: Does the Government's economic proposition hold? / Halimatussadiah, A.; Nainggolan, D.; Yui, S.; Moeis, F.R.; Siregar, A.A.. Renewable and Sustainable Energy Reviews8. ISSN: 1364-0321 (2021) v.150 Issue. p.111431. 150

Url: https://www.sciencedirect.com/science/article/pii/S1364032121007140

DOI: 10.1016/j.rser.2021.111431

Abstract: Crude palm oil (CPO)-based biodiesel is Indonesia's main product as part of the Government of Indonesia's (GoI) biofuel policy to secure energy, reduce trade balance deficit and subsidy, and lower emissions. Indonesia's biodiesel policy is progressive. In late 2019, biodiesel blending reached 30% of fatty acid methyl ester (FAME) and 70% of diesel, known as B30. The government sees the biodiesel policy as beneficial on the basis of its expected diesel import saving. However, it fails to take into account the potential export loss emerging from the opportunity cost of foreign exchange. Moreover, the macroeconomic impacts of biodiesel policy remain understudied. Using available input and output data, CPO and biodiesel projected balance sheets were constructed for 2020 to 2030 based on four biodiesel blending scenarios. Assessments were then made to reveal each scenario's impact on trade balance, subsidy, and land expansion. The present study found that: (1) while the biodiesel policy lowers diesel imports, the potential CPO export loss outweighs the import savings, (2) the biodiesel policy's impact on subsidy is highly dependent on the subsidy rate of FAME and diesel, and (3) land expansion of 48% to 76% of current productive oil palm plantation area is inevitable to support the ambitious biodiesel policy. Overall, the findings indicate that more progressive policies pose greater macroeconomic and environmental risks. The GoI should develop a clear roadmap for optimal biodiesel blending levels to deliver energy security and desirable economic and environmental impacts.

Keyword: Indonesia; Biodiesel; Land expansion; Palm oil; Renewable energy; Subsidy; Trade balance

9. Promoting agricultural technologies with positive environmental effects: Evidence on tree planting in Indonesia / Brenneis, Karina; Irawan, Bambang; Wollni, Meike. Ecological Economics9. ISSN: 0921-8009 (2023) v.204 Issue. p.107666. 204

Url: https://www.sciencedirect.com/science/article/pii/S0921800922003275

DOI: 10.1016/j.ecolecon.2022.107666

Abstract: In the presence of market inefficiencies and missing information, agricultural technologies have often been introduced via subsidies to accelerate diffusion and spur adoption. Yet, for agricultural technologies that mainly generate positive environmental effects, it is not clear how subsidies affect adoption, maintenance, and additional investments. This study introduces native tree seedlings through two different distribution mechanisms to foster tree planting in an oil palm hotspot in Indonesia. In treatment one, oil palm farmers receive information about native tree planting and three different native tree seedlings for free (subsidy treatment). In treatment two, oil palm farmers

receive the same information and the opportunity to buy three different native tree seedlings through an auction (price treatment). The results show that conditional on receiving the seedlings the uptake of the technology is similar between the two treatments, suggesting that there is no strong selection effect in the price treatment. For the full sample, the subsidy treatment is associated with higher tree planting activities. The farmers in the subsidy treatment apply less maintenance to their trees, but the number of surviving trees is still higher than in the price treatment. Finally, the subsidy treatment tends to be associated with lower additional planting efforts.

Keyword: Auction; Policy analysis; Randomized controlled trial; Subsidies; Technology adoption

10. Imaginaries of blue transformations: Just seaweed narratives in European Union and Indonesian seaweed farming policies / Albrecht, Moritz; Ramdani, Rijal; Pranaja, Kevin Arya. Marine Policy10. ISSN: 0308-597X (2025) v.178 Issue. p.106728. 178

Url: https://www.sciencedirect.com/science/article/pii/S0308597X25001435

DOI: 10.1016/j.marpol.2025.106728

Abstract: Blue economy practices and policies have faced substantial criticism regarding their ability to support a just blue transformation. In response, a policy maturation process has incorporated blue justice rhetoric into many blue economy strategies. However, the extent to which these new policy narratives genuinely promote a just blue transformation remains unclear. This paper addresses the issue by examining the integration of justice components in the seaweed policies of the European Union and Indonesia. By focusing on a key player and an ambitious newcomer in global seaweed production, the study provides fresh insights into how justice narratives in transnational seaweed policies influence the sector's potential for a just future. The analysis reveals a problematic framing in both policy spheres, which promotes a "conditional justice" approach. This framing is misaligned with a balanced integration of distributive, procedural, and recognition justice. Consequently, despite their rhetorical commitments to justice, these policies raise concerns about their capacity to achieve a truly just blue transformation.

Keyword: Indonesia; European Union; Just blue economy; Legitimization imaginaries; Policy narratives; Seaweed policies

11. Socio-techno-economic assessment to design an appropriate renewable energy system for remote agricultural communities in developing countries / Pandyaswargo, Andante Hadi; Wibowo, Alan Dwi; Onoda, Hiroshi. Sustainable Production and Consumption11. ISSN: 2352-5509 (2022) v.31 Issue. p.492-511. 31

Url: https://www.sciencedirect.com/science/article/pii/S2352550922000628

DOI: 10.1016/j.spc.2022.03.009

Abstract: Access to clean energy for communities living in remote areas where grid extension is considered unfeasible can be provided by off-grid electrification systems using renewable energy (RE). Especially in developing countries, ensuring the appropriateness of such systems is crucial because it

will determine the system's sustainability despite its limited resources. This study demonstrates the design process of an appropriate system by assessing the potential of three RE sources: solar, wind, and biomass in an oil palm and rubber-tree plantation village in South Kalimantan Province, Indonesia. A social assessment is done to avoid sustainability issues of the previously introduced technology intervention by identifying correlations between residents' attributes and satisfaction levels on a selection of social values through multiple correspondence analysis (MCA) and nonparametric methods. The techno-economic assessment and sensitivity analysis uses local data processed with the Hybrid Optimization of Multiple Energy Resources (HOMER) software. Results identified the need for a more appropriate clean energy supply for cooking, the potential role of modern technology, and access to information and communication in income generation, among other needs and opportunities that can be linked with the energy system design. The technical assessment showed that a centralized solar power plant paired with a diesel engine could provide power to the village. However, the cost of electricity (COE) is much higher than the price cap introduced by the national electricity company. This study urges a clear mechanism and a guarantee for the delivery of feed-in-tariffs (FIT) and a price cap exemption for off-grid RE systems. Furthermore, a people-centered public–private partnership business model and a remote capacity-building intervention are also needed. An appropriate energy system design must be supported by an enabling environment and supporting policies to be feasible.

Keyword: Renewable energy; MCA; Off-grid electrification; Rural development; Sustainability assessment; Sustainable development

12. Vegetable mapping using fuzzy classification of Dynamic Time Warping distances from time series of Sentinel-1A images / Moola, Wisdom Simataa; Bijker, Wietske; Belgiu, Mariana; Li, Mengmeng. International Journal of Applied Earth Observation and Geoinformation12. ISSN: 1569-8432 (2021) v.102 Issue. p.102405. 102

Url: https://www.sciencedirect.com/science/article/pii/S0303243421001124

DOI: 10.1016/j.jag.2021.102405

Abstract: Vegetable production is important because of the food security, diet improvement and socio-economic value. Mapping the location and extent of vegetable fields is therefore important in agricultural policy, food security and farmer support. Dynamic Time Warping (DTW) is a common way to map crops from time series of satellite images. However, as all hard classifications, it does not show the spatial distribution of uncertainty in the classification. In fuzzy classification, where memberships to multiple classes are assigned to each pixel, differences in membership between the first and the runners-up class can be used to assess classification uncertainty at the pixel level. This research formulates a fuzzy classifier based upon Time-Weighted Dynamic Time Warping (TWDTW) distances to map vegetable types from time series of Sentinel-1A SAR images. For each pixel, the TWDTW distances to the classes was normalised by dividing them by the sum of all TWDTW distances to all the classes for that pixel. The normalized distances were then used to compute fuzzy memberships for each pixel to each class, using the Gaussian membership function. Based on these memberships, fuzzy measures such as Confusion Index (CI), Ambiguity Index (AI), fuzziness and fuzzy membership were calculated and different thresholds applied on each of the measures during subsequent defuzzification. The overall accuracy and kappa coefficient of the defuzzified output results were 0.86 and 0.83, respectively, which was an improvement with regard to the crisp Time-Weighted Dynamic

Time Warping with SPRING strategy for subsequence searching (TWDTWS) algorithm with 0.73 and 0.68 for overall accuracy and kappa, respectively. This study concludes that this new approach improves classification accuracy in image classification by excluding pixels with high uncertainty, which is especially relevant when only a limited number of classes are sampled and mapped.

Keyword: Ambiguity index; Confusion index; Fuzziness; Fuzzy membership; TWDTWS

13. Collective action in a smallholder oil palm production system in Indonesia: The key to sustainable and inclusive smallholder palm oil? / Jelsma, Idsert; Slingerland, Maja; Giller, Ken E.; Bijman, Jos. Journal of Rural Studies13. ISSN: 0743-0167 (2017) v.54 Issue. p.198-210. 54

Url: https://www.sciencedirect.com/science/article/pii/S0743016716303941

DOI: 10.1016/j.jrurstud.2017.06.005

Abstract: Indonesian smallholder oil palm generally yield much less than corporate plantations. We analysed a smallholder oil palm production system in West Sumatra which outperformed its nucleus estate plantation, consistently producing yields far above the national average for over 25 years. Its institutional setup allowed farmers to combine the advantages of smallholder and plantation agriculture by capitalizing on collective action. Collective action design principles (Ostrom, 1990; Cox, 2010) are used to assess the institutional setup of a smallholder production system. This case study demonstrates that with a strong institutional arrangement, smallholder oil palm farmers can participate in supply chains on advantageous conditions and substantially increase productivity, thereby contributing to both rural development and land sparing.

Keyword: Indonesia; Collective action; Intensive agriculture; Oil palm; Smallholders; West-Sumatra

14. The Implications of Economic Change in Indonesia for Social Class Formation / Booth, Anne. Bijdragen tot de taal-, land- en volkenkunde / Journal of the Humanities and Social Sciences of Southeast Asia14. ISSN: 0006-2294 (2021) v.177 Issue. 4p.461-490. 177

Url: https://www.sciencedirect.com/science/article/pii/S0006229421000204

DOI: 10.1163/22134379-bja10029

Abstract: This article investigates the relationship between economic growth and changing class structures in Indonesia over the last century, with particular emphasis on the post-independence decades. Investigations carried out in the colonial era found that access to land and to government employment were crucial determinants of both income and social status. After 1950, these factors continued to be important, but in addition some studies also examined the growth of the private sector outside agriculture and its implications for changing social stratification among indigenous Indonesians. In recent times, contributions to the literature on the middle class have been made by international agencies (such as the Asian Development Bank and the World Bank). These studies have defined the middle class in terms of household income or expenditures and have argued that the middle class in Indonesia is growing and is now larger than the number of people living in poverty. The implications of this for future government policies are discussed.

Keyword: Indonesia; class formation; colonial period; postindependence; social stratification

15. Data-driven natural capital accounting model in Indonesia: Impacts of environmentally related economic activities on ecological processes and services / Kurrahman, Taufik; Tsai, Feng Ming; Sethanan, Kanchana; Lim, Ming K.; Tseng, Ming-Lang. Journal of Cleaner Production15. ISSN: 0959-6526 (2024) v.469 Issue. p.143213. 469

Url: https://www.sciencedirect.com/science/article/pii/S0959652624026623

DOI: 10.1016/j.jclepro.2024.143213

Abstract: In this study, natural capital accounting (NCA) is enhanced by constructing a data-driven hierarchical model that can help improve policy decision-making. NCA enables the management and transparency of natural capital and ecological processes and services, resulting in better societal activities and well-being in Indonesia's regions; however, it does not account for environmentally related economic activities that may negatively influence natural capital, processes and services. In this study, a data-driven approach is used to address this issue. Valid attributes are identified, and a thorough NCA hierarchical model that incorporates synchronized accounting on ecology, environment-related economic activities and societal well-being is developed. This approach utilizes content and bibliographic analyses, the entropy weighted method (EWM) and the fuzzy Delphi method (FDM), which are used to validate the data-driven NCA measurements. Exploratory factor analysis (EFA) is utilized to cluster the measurements and assess their reliability. The fuzzy decision-making trial and evaluation laboratory (FDEMATEL) is used to construct the NCA hierarchical structure by considering the cause-and-effect interrelationships among attributes. The valid prioritized attributes are determined, and a hierarchical structure is built to support government decision-making processes. The findings suggest that water resource accounting, forestry production, raw material extraction, resource allocation management and resource consumption management are the criteria that fluctuate the most for practitioners and governments.

Keyword: Big data analytics; Content analysis; Ecological process and service; Environment-related economic activities; Fuzzy DEMATEL; Natural capital accounting

16. Spatial heterogeneity in smallholder oil palm production / Sibhatu, Kibrom T.; Steinhübel, Linda; Siregar, Hermanto; Qaim, Matin; Wollni, Meike. Forest Policy and Economics16. ISSN: 1389-9341 (2022) v.139 Issue. p.102731. 139

Url: https://www.sciencedirect.com/science/article/pii/S1389934122000430

DOI: 10.1016/j.forpol.2022.102731

Abstract: Oil palm production is an important income source for millions of smallholder farmers in the tropics. Oftentimes, yields in smallholder systems are low, entailing larger area requirements and higher than necessary rates of deforestation. Smallholder performance differs spatially, even within countries and provinces. A better understanding of this spatial variation can help to design more effective support programs to preserve forestland and foster sustainable economic development. Here, we use survey data from smallholder oil palm producers in Sumatra, Indonesia, to identify spatial

variation in yields, input use, and output prices by employing structured additive regression models with nonlinear spatial effects, so-called geosplines. Our results confirm large spatial differences. Some of these differences can be explained. For instance, possession of land titles and proximity to urban centers are positively associated with oil palm productivity. However, much of the spatial variation cannot be explained by variables typically included in socioeconomic studies. The geosplines help to control for possible bias even when the identified spatial variation cannot be fully explained. From a policy perspective, knowing where regions with high and low yields and input intensities are located can help to geographically target suitable support programs. From a research perspective, more work on trying to explain spatial heterogeneity in smallholder production is needed, possibly combining quantitative and qualitative approaches.

Keyword: Indonesia; Oil palm; Agricultural policies; Smallholder farm households; Spatial heterogeneity; Sustainability

17. Impacts of droughts and floods on croplands and crop production in Southeast Asia – An application of Google Earth Engine / Venkatappa, Manjunatha; Sasaki, Nophea; Han, Phoumin; Abe, Issei. Science of The Total Environment17. ISSN: 0048-9697 (2021) v.795 Issue. p.148829. 795

Url: https://www.sciencedirect.com/science/article/pii/S0048969721039012

DOI: 10.1016/j.scitotenv.2021.148829

Abstract: While droughts and floods have intensified in recent years, only a handful of studies have assessed their impacts on croplands and production in Southeast Asia. Here, we used the Google Earth Engine to assess the droughts and floods and their impacts on croplands and crop production over 40 years from 1980 to 2019. Using the Palmer Drought Severity Index (PDSI) as the basis for determining the drought and flood levels, and crop damage levels, crop production loss in both the Monsoon Climate Region (MCR) and the Equatorial Climate Region (ECR) of Southeast Asia was assessed over 47,192 grid points with 10 × 10-kilometer resolution. We found that rainfed crops were severely affected by droughts in the MCR and floods in the ECR. About 9.42 million ha and 3.72 million ha of cropland was damaged by droughts and floods, respectively. We estimated a total loss of 20.64 million tons of crop production between 2015 and 2019. Rainfed crops in Thailand, Cambodia, and Myanmar were strongly affected by droughts, whereas Indonesia, the Philippines, and Malaysia were more affected by floods over the same period. Accordingly, four levels of policy interventions were prioritized by considering the geolocated crop damage levels.

Keyword: Drought; Climate change; Southeast Asia; Agriculture; Crop damage; Google Earth Engine; PDSI; Policy interventions

18. Unveiling complementarities between mangrove restoration and global sustainable development goals / Gong, Mimi; Teller, Noah; Golebie, Elizabeth J.; Aczel, Miriam; Jiang, Zhimeng; Van Zeghbroeck, Joris; Liu, Jianguo. Journal of Cleaner Production18. ISSN: 0959-6526 (2024) v.474 Issue. p.143524. 474

Url: https://www.sciencedirect.com/science/article/pii/S0959652624029731

DOI: 10.1016/j.jclepro.2024.143524

Abstract: Indonesia, renowned as the most mangrove-rich nation, has committed to extensive mangrove restoration policies, but the effects of these policies have yet to be systematically evaluated. Our study conducts a comprehensive network analysis to investigate the synergies between mangrove restoration policy and global Sustainable Development Goals (SDGs) achievements by exploring their interactions. This investigation follows the 'product space' method in economics and creates the 'Mangrove-SDG space' to assess each metric pair's co-occurrence and comparative advantages with validated stability. Our analysis unveils a tripartite structure, encompassing socio-economic and environmental clusters, each significantly contributing to global sustainability and a distinctive mangrove cluster tied to land attributes. At the Goal level, mangrove loss showcases robust synergies with SDGs 12 (Responsible Consumption and Production) and 13 (Climate Change), and mangrove metrics such as tropical storm frequency and mangrove change, indicating strong interdependences between mangrove forests and SDGs. The result indicates that improved performance of climate change and responsible consumption can greatly enhance mangrove forests' performance in alleviating mangrove loss and reducing tropical storms. Moreover, our analysis underscores the central roles played by 'bridge' Goals. Indicator-level space details how they warrant prioritization because of their cascade synergistic enhancements across widely interconnected indicators, triggering systematic positive improvements. Turning to Indonesia, we advocate a strategic shift from solely expanding mangrove extent to focusing on four critical policy priorities: effective nitrogen management, enhancing Ramsar site efficiency, optimizing logistic performance, and addressing urban population conditions. These priorities are pivotal to seeking complementarities between Indonesia's international sustainability commitment and fostering mangrove restoration success.

Keyword: Indonesia; Complementarities; Mangrove management; Policy priorities; Sustainable Development Goals

19. Evaluating bundles of interventions to prevent peat-fires in Indonesia / Carmenta, Rachel; Zabala, Aiora; Trihadmojo, Bambang; Gaveau, David; Salim, Mohammad Agus; Phelps, Jacob. Global Environmental Change19. ISSN: 0959-3780 (2021) v.67 Issue. p.102154. 67

Url: https://www.sciencedirect.com/science/article/pii/S0959378020307378

DOI: 10.1016/j.gloenvcha.2020.102154

Abstract: The carbon-dense peatlands of Indonesia are a landscape of global importance undergoing rapid land-use change. Here, peat drained for agricultural expansion increases the risk of large-scale uncontrolled fires. Several solutions to this complex environmental, humanitarian and economic crisis have been proposed, such as forest protection measures and agricultural support. However, numerous programmes have largely failed. Bundles of interventions are proposed as promising strategies in integrated approaches, but what policy interventions to combine and how to align such bundles to local conditions remains unclear. We evaluate the impact of two types of interventions and of their combinations, in reducing fire occurrence through driving behavioural change: incentives (i.e. rewards that are conditional on environmental performance), and deterrents (e.g. sanction, soliciting concerns for health). We look at the impact of these interventions in 10 villages with varying landscape and fire-risk contexts in Sumatra, Indonesia. A private-led implementation of a standardised programme allows us to study outcome variability through a natural experiment design. We conduct a systematic cross-case comparison to identify the most effective combinations of interventions, using

two-step qualitative comparative analysis (QCA) and geospatial and socio-economic survey data (n = 303). We analysed the combined influence of proximate conditions (interventions, e.g. fear of sanction) and remote ones (context; e.g. extent of peat soil) on fire outcomes. We show how, depending on the level of risk in the pre-existing context, certain bundles of interventions are needed to succeed. We found that, despite the programme being framed as rewards-based, people were not responding to the reward alone. Rather sanctions and soliciting concern appeared central to fire prevention, raising important equity implications. Our results contribute to the emerging global interest in peat fire mitigation, and the rapidly developing literature on PES performance.

Keyword: Oil palm; Carbon; Governance; Payments for ecosystem services; Public-private; QCA

20. Meeting global land restoration and protection targets: What would the world look like in 2050? / Wolff, Sarah; Schrammeijer, Elizabeth A.; Schulp, Catharina J.E.; Verburg, Peter H.. Global Environmental Change20. ISSN: 0959-3780 (2018) v.52 Issue. p.259-272. 52

Url: https://www.sciencedirect.com/science/article/pii/S0959378017311718

DOI: 10.1016/j.gloenvcha.2018.08.002

Abstract: Land restoration has received increased attention recently as a tool to counteract negative externalities of unsustainable land management on human well-being. This is reflected in targets of the Sustainable Development Goals (SDGs), the Convention on Biological Diversity (CBD), the United Nations Framework of the Convention on Climate Change (UNFCCC) and the United Nations Convention to Combat Desertification (UNCCD). However, the implications of these targets for land use, especially considering their potential conflict with growing food production demands, are largely unexplored. We study the potential and aggregated consequences of meeting these targets on land cover and land system change. We do so by analyzing targets originating from these global commitments towards land restoration and protection and implement them in a global land system change model. We compare this Restoration and Protection scenario with simulation results of two plausible pathways of socio-economic development in the absence of these targets, following the Shared Socio-Economic Pathway (SSP) storylines. We find that meeting global land restoration and protection targets would increase global tree cover by 4 million km², increasing forest carbon stocks by 50 Gt and protecting 28% of the terrestrial area with the highest value of both biodiversity and carbon storage. Gains in tree cover and natural land systems would cause a contraction of crop, pasture- and bare land. This results in further cropland intensification and the expansion of land systems that are combining land use demands in mosaics of forest and agriculture. Without these targets, land system architecture tends to become more specialized, while many carbon and biodiversity hotspots, such as in the Americas, India, and Indonesia would be lost. Grassland-agriculture mosaics were threatened by land use change under all scenarios, requiring greater consideration in research and environmental policy. Our results emphasize the need for targeted land management in line with the analyzed policy targets if global restoration and protection targets are to be achieved.

Keyword: Ecosystem services demand; Land change modelling; Land restoration; Scenarios; Sustainable development goals

21. Making illegality visible: The governance dilemmas created by visualising illegal palm oil plantations in Central Kalimantan, Indonesia / Astuti, Rini; Miller, Michelle Ann; McGregor, Andrew; Sukmara, M. Dedy Pratama; Saputra, Wiko; Sulistyanto; Taylor, David. Land Use Policy21. ISSN: 0264-8377 (2022) v.114 Issue. p.105942. 114

Url: https://www.sciencedirect.com/science/article/pii/S0264837721006657

DOI: 10.1016/j.landusepol.2021.105942

Abstract: This study focuses on how Indonesia's One Map Policy renders illegal palm oil plantations in Indonesia visible and the governance dilemmas this creates. Using Central Kalimantan as a case study, we first draw on spatial data to visualise the extent of illegal palm oil plantations on forest land. The vast majority of illegal palm oil is large plantations, with illegal independent smallholdings constituting just 0.4%. We then draw on key stakeholder interviews to analyse the governance dilemmas such visualisations create. We explore stakeholder perspectives of the new Omnibus Law and other attempts to legalise illegality. Four governance scenarios that emphasise the interests of either business, smallholders, environments, or adopt a multi-stakeholder perspective are developed and measured according to their different social and ecological land use implications. In the interests of promoting sustainable and effective governance for forests, peatlands and palm oil production, we caution against the pro-business option currently favoured by the Indonesian government that aims to legalise illegal plantations and which risks the reassignment of forests for commercial production. Our article outlines alternative policy solutions, including an approach that seeks to balance business and environmental interests while also paying heed to sustainable development needs. This approach could be applied in other contexts similarly struggling with the governance dilemmas about what to do when widespread land use illegalities are made visible.

Keyword: Indonesia; Forest governance; Illegal plantations; Omnibus Law; One Map Policy; Palm oil sector

22. Land cover modelling for tropical forest vulnerability prediction in Kalimantan, Indonesia / Sari, Inggit Lolita; Weston, Christopher J.; Newnham, Glenn J.; Volkova, Liubov. Remote Sensing Applications: Society and Environment22. ISSN: 2352-9385 (2023) v.32 Issue. p.101003. 32

Url: https://www.sciencedirect.com/science/article/pii/S235293852300085X

DOI: 10.1016/j.rsase.2023.101003

Abstract: This study aimed to estimate the vulnerability of tropical forest in Kalimantan, Indonesia, from simulated land cover changes using the Weighted Normalised Likelihood–Markov Chain model (WNL-MC) for the period 2018–2050 under a forest conservation and a no-conservation scenario. Predictions of future vulnerability and forest change were based on land cover maps for 2010 and 2014 developed using the integration of Landsat, ALOS PALSAR, and Sentinel-1 data. The four main land cover classes in the region were oil palm and rubber plantations, native forests, and non-forested areas. The performance of the WNL–MC model was evaluated by comparing the simulated and actual land cover maps for 2018 and validating them against high-resolution images. Kappa accuracy for the simulated maps was >85%, and overall accuracy was >90%. Under the scenario of no forest conservation, native forest showed approximately 50% loss over the next 30 years, while the forest

conservation scenario showed a slowing of current deforestation by 18% from 2018 to 2030 and by 5.95% from 2030 to 2050. Native forest outside forest conservation zones was most vulnerable to conversion to other land uses, particularly in lowland areas close to settlements and roads. Estimations of native forest loss, particularly under the no-conservation scenario, emphasise the need for policies to preserve and conserve remaining native forest areas.

Keyword: Forest conservation; Land change model; Oil palm plantation; Rubber plantation; Weighted normalised Likelihood–Markov chain

23. Understanding factors affecting non-participants' interest in community-supported agriculture / Rahmatika, Maula Fadhilata; Suman, Agus; Syafitri, Wildan; Muljaningsih, Sri. Regional Sustainability23. ISSN: 2666-660X (2024) v.5 Issue. 3p.100160. 5

Url: https://www.sciencedirect.com/science/article/pii/S2666660X24000598

DOI: 10.1016/j.regsus.2024.100160

Abstract: Community-supported agriculture (CSA) has emerged as a viable solution for addressing the agricultural challenges faced by countries like Indonesia. This study uses the well-established unified theory of acceptance and use of technology (UTAUT2) model to examine the interest in CSA of potential customers in Indonesia. A standardized questionnaire was distributed to 1200 respondents, and the data were analyzed using structural equation model-partial least square (SEM-PLS) in SmartPLS 4.0 software. The results capture potential CSA consumer interest and will help to improve CSA development strategies in Indonesia. The model explains 44.4% of customers' intentions, and identifies performance expectancy as the decisive factor in customers' willingness to participate in CSA. Performance expectancy (0.292), hedonic motivation (0.262), social influence (0.259), and facilitating conditions (0.086) positively influence customers' interest in participating in a CSA program. The adoption of CSA programs by both farmers and customers could be increased by implementing regulations that provide tax incentives and subsidies, offering training on sustainable farming practices, facilitating the establishment of distribution channels, and establishing guidelines for fair price and quality standards. This study shows the high potential for the implementation of CSA in Indonesia. It could also be used as a foundation for the development of new policies regarding sustainable agriculture markets in Indonesia.

Keyword: Indonesia; Behavioral intention; Community-supported agriculture (CSA); Performance expectancy; Sustainable agriculture; Unified theory of acceptance and use of technology model

24. Causes of Indonesia's forest fires / Edwards, Ryan B.; Naylor, Rosamond L.; Higgins, Matthew M.; Falcon, Walter P.. World Development24. ISSN: 0305-750X (2020) v.127 Issue. p.104717. 127

Url: https://www.sciencedirect.com/science/article/pii/S0305750X19303663

DOI: 10.1016/j.worlddev.2019.104717

Abstract: The economic costs of Indonesia's 2015 forest fires are estimated to exceed US $16 billion, with more than 100,000 premature deaths. On several days the fires emitted more carbon dioxide

than the entire United States economy. Here, we combine detailed geospatial data on fire and local climatic conditions with rich administrative data to assess the underlying causes of Indonesia's forest fires at district and village scales. We find that El Niño events explain most of the year-on-year variation in fire. The creation of new districts increases fire and exacerbates the El Niño impacts on fire. We also find that regional economic growth has gone hand-in-hand with the use of fire in rural districts. We proceed with a 30,000-village case study of the 2015 fire season on Sumatra and Kalimantan and ask which villages, for a given level of spatial fire risk, are more likely to have fire. Villages more likely to burn tend to be more remote, to be considerably less developed, and to have a history of using fire for agriculture. Although central and district level policies and regional economic development have generally contributed to voracious environmental degradation, the close link between poverty and fire at the village level suggests that the current policy push for village development might offer opportunities to reverse this trend.

Keyword: Indonesia; Rural development; Decentralization; Economic growth; El Nino; Forest fire; Poverty

25. An extended Input–Output framework for evaluating industrial sectors and provincial-level water consumption in Indonesia / Mohan, Geetha; Chapagain, Saroj Kumar; Fukushi, Kensuke; Papong, Seksan; Sudarma, I.Made; Rimba, Andi Besse; Osawa, Takahiro. Water Resources and Industry25. ISSN: 2212-3717 (2021) v.25 Issue. p.100141. 25

Url: https://www.sciencedirect.com/science/article/pii/S2212371721000044

DOI: 10.1016/j.wri.2021.100141

Abstract: This paper provides an extended input–output (IO) model of sectoral water consumption for Bali, a province located in Indonesia that is a well-known global tourist destination. Currently, the province is experiencing water shortages, which leads to a burden and heavy competition in water usage among the various economic sectors. We developed a method for determining which industrial/economic sectors directly and indirectly consume the most substantial quantities of water and to what extent available water resources can become a restrictive factor in the development of leading economic sectors. We also used another method, backward and forward linkage indices, to identify the key sectors influencing water consumption. The results confirm that the agriculture sectors, including other food crops, non-food crops, and rice, consume the highest portion of total water consumption. However, indirect water consumption appears to comprise a vital share of total water resources. These sectors—including the livestock industry; food, beverage, tobacco, and coffee industries; the timber industry; wood products, crafts and minerals industry; trading; construction; and other processing industries—have the highest indirect consumption. Our model for direct and indirect water consumption is a useful tool for water and economic planning policymakers for devising water-saving policies and expanding the provincial economy.

Keyword: Economic sectors; Input–output (IO) model; Inter-industrial linkages; Multipliers; Water consumption

26. Regional rural transformation and its association with household income and poverty incidence in Indonesia in the last two decades / SUDARYANTO, Tahlim; ERWIDODO; DERMOREDJO, Saktyanu Kristyantoadi; PURBA, Helena Juliani; RACHMAWATI, Rika Reviza; IRAWAN, Aldho Riski. Journal of Integrative Agriculture26. ISSN: 2095-3119 (2023) v.22 Issue. 12p.3596-3609. 22

Url: https://www.sciencedirect.com/science/article/pii/S2095311923004264

DOI: 10.1016/j.jia.2023.11.029

Abstract: Increasing rural household income and reducing poverty rank among Indonesia's top development priorities. Promoting rural transformation is one strategic policy framework to achieve these goals. In the last three decades, agricultural production has shifted from low-value food crops to high-value commodities, such as horticulture, estate crops, and livestock. Previous studies have analyzed rural transformation in Indonesia at the national level, but information on the magnitudes of impact across regions remains scarce. This study aims to analyze the changes in rural transformation at a regional level in the past two decades. The research utilizes secondary data from Statistics Indonesia (BPS), covering 34 provinces from 2000 to 2020, analyzed using descriptive and panel data regression analyses. The results show an increasing trend in the share of high-value agriculture (RT1) and rural non-farm employment (RT2). Both RT1 and RT2 are positively associated with the growth of rural household income and a lower poverty rate. However, the speed of structural transformation (ST), RT1, RT2, rural income growth, and poverty reduction vary across regions. This research implies that improving rural income and reducing poverty should be done by integrating policies, i.e., promoting high-value agriculture and expanding rural non-farm employment. Particular attention should also be given to provinces with slow growth in ST, RT1, RT2, and rural household income.

Keyword: high-value agriculture; rural non-farm employment; rural transformation

27. Interdependencies and telecoupling of oil palm expansion at the expense of Indonesian rainforest / Rulli, Maria Cristina; Casirati, Stefano; Dell'Angelo, Jampel; Davis, Kyle Frankel; Passera, Corrado; D'Odorico, Paolo. Renewable and Sustainable Energy Reviews27. ISSN: 1364-0321 (2019) v.105 Issue. p.499-512. 105

Url: https://www.sciencedirect.com/science/article/pii/S1364032118308529

DOI: 10.1016/j.rser.2018.12.050

Abstract: Global palm oil production has greatly increased in recent years with the adoption of renewable energy policies by the E.U. and U.S.A. and growing demand for its use in food, biodiesel, and other commodities. Indonesia, the world's largest oil palm producer, has leased large tracts of forested and tribal lands as new concessions, thereby expanding oil palm plantations. While previous studies have focused on some of the important social and environmental consequences of this process, the full suite of potential environmental impacts from land conversion and cultivation remains poorly understood. Here we quantify these impacts in terms of forest loss and fragmentation, CO2 emissions from land use change, and freshwater pollution from fertilizer application. Within all concession types, forest cover decreased by 20% and forest fragmentation increased by 44%, both of which are significantly higher than in comparable non-concession areas. We also assess to what extent CO2 emissions and freshwater pollution are attributable to increasing palm oil demand abroad. We find that four-fifths of Indonesia's palm oil production is for export markets and that 66% of this is

destined for just eight countries – India, China, Pakistan, Malaysia, Italy, Egypt, Bangladesh, and the United Kingdom. Examining these multiple impacts highlights the importance of remote policies and consumption patterns in dictating local production decisions in a telecoupled world. This work demonstrates that - in order to be truly sustainable - bioenergy initiatives must ensure that adverse environmental impacts (and the demands that drive them) are reduced globally and not simply displaced elsewhere.

Keyword: Indonesia; Deforestation; Oil palm; Biofuel; Fragmentation; Globalization; Rainforest; Telecoupling; Water scarcity, CO2 emissions

28. Applying the DPSIR framework to qualitatively assess the globally important mangrove ecosystems of Indonesia: A review towards evidence-based policymaking approaches / Quevedo, Jay Mar D.; Lukman, Kevin Muhamad; Ulumuddin, Yaya Ihya; Uchiyama, Yuta; Kohsaka, Ryo. Marine Policy28. ISSN: 0308-597X (2023) v.147 Issue. p.105354. 147

Url: https://www.sciencedirect.com/science/article/pii/S0308597X22004018

DOI: 10.1016/j.marpol.2022.105354

Abstract: Indonesia has the largest extent of mangroves globally, supporting communities at the local scale while contributing to climate change mitigation at the global scale. Yet, they are highly threatened by multiple anthropogenic and natural stressors. Thus, in this study, we aim to qualitatively assess Indonesia's mangrove ecosystems by conducting a literature review applying the Driver-Pressure-State-Impact-Response (DPSIR) framework. By using the framework, we identified multiple stressors and existing management efforts in 27 provinces of Indonesia. For instance, we identified aquaculture expansion as the most frequented driver of mangrove loss leading to the conversion of mangroves to shrimp farms in 20 provinces. In terms of responses, mangrove rehabilitation and community-based management have a long history in Indonesia while economic valuation and payment of ecosystem services are yet to be established across the country. The identification of multiple stressors and/or threats is instrumental to addressing the causes of degradation of globally-important mangroves in Indonesia if effectively translated into policies, which remains a future challenge.

Keyword: Indonesia; Blue carbon; DPSIR; Literature review; Mangroves

29. Protected area effectiveness in a sea of palm oil: A Sumatran case study / Poor, Erin E.; Frimpong, Emmanuel; Imron, Muhammad Ali; Kelly, Marcella J.. Biological Conservation29. ISSN: 0006-3207 (2019) v.234 Issue. p.123-130. 234

Url: https://www.sciencedirect.com/science/article/pii/S0006320718313399

DOI: 10.1016/j.biocon.2019.03.018

Abstract: Despite the establishment of a national protected area system at the beginning of the 20th century to protect some of the world's most biodiverse forests, Indonesia has one of the highest deforestation rates in the world, due in part to the expansion of the global palm oil industry. The

unique ecosystems of Sumatra, Indonesia provide habitat for critically endangered Sumatran tigers (Panthera tigris sumatrae), Sumatran elephants (Elephas maximus sumatrensis), and two species of orangutans (Pongo abelii and Pongo tapanuliensis). In this study, we use a matching method with generalized boosted models to determine the effectiveness of three nationally protected areas in preventing deforestation from 2002 to 2016. We also examine leakage – an increase in deforestation directly outside of protected areas relative to the wider landscape – to provide a clearer picture of the effects of agricultural expansion in this landscape. We found that Tesso Nilo National Park, with its lowland rain forest and conditions suitable for oil palm, offered the least protection from deforestation (avoided deforestation rate = 4.18%, $p < 0.05$ 95% CI [1.97% - 6.45%]). Bukit Tigapuluh National Park, which may experience some de facto protection (i.e. protection due to factors independent of policy) with its mountainous terrain and difficult access, had the highest avoided deforestation rate (26.36%, $p < 0.05$ 95% CI [24.17–28.55]), but had relatively high leakage (10.21%, $p < 0.05$ 95% CI [7.51–12.98]). The low avoided deforestation rate in Tesso Nilo could be due to high localized human population and/or other socio-economic factors we were unable to control for in this study. The quantitative evidence of deforestation and effectiveness of protected areas in this heavily modified landscape supports the need for increased enforcement around protected areas locally, and globally in other oil palm production regions. These actions are critical in the preservation of global, tropical endemic flora and fauna. Indonesian abstract Meskipun telah membangun sistem kawasan konservasi sejak awal abad ke 20 untuk melindungi hutan dengan keanekaragaman hayati yang sangat tinggi, Indonesia masih merupakan negara yang memiliki laju deforestasi yang tertinggi di dunia, akibat penkembangan industri sawit di dunia. Ekosistem-ekosistem endemic di Sumatera-Indonesia merupakan habitat bagi spesies-spesies yang memiliki status konservasi kritis yaitu harimau Sumatera (Panthera tigris sumatrae), gajah Sumatera (Elephas maximus sumatrensis), dan dua species orangutan (Pongo abelii dan Pongo tapanuliensis). Dalam penelitian ini, kami menggunakan metode matching dengan model generalized boosted untuk menentukan efektivitas dari tiga kawasan konservasi dalam mencegah terjadinya deforestasi dari tahun 2002–2016. Kami juga menilai leakage (kebocoran) – yang merupakan kenaikan laju deforestasi pada area yang berdekatan dengan kawasan konservasi– untuk memberikan gambaran yang utuh atas dampak industri sawit dunia. Kami menemukan bahwa Taman Nasional Tesso Nilo, dengan habitat dan kondisi hutan tropis dataran rendah, yang juga sesuai untuk tanaman sawit, merupakan kawasan konservasi yang memiliki kemampuan paling rendah dalam melindungi dari deforestasi (laju pencegahan deforestasi = 4.18%, $p < 0.05$ 95% CI [1.97% - 6.45%]). Sedangkan Taman Nasional Bukit Tigapuluh yang merupakan kawasan pegunungan memiliki laju pencegahan deforestasi tertinggi (26.36%, $p < 0.05$ 95% CI [24.17–28.55]), namun memilki nilai kebocoran yang relatif tinggi (10.21%, $p < 0.05$ 95% CI [7.51–12.98]). Fakta kuantitatif dari deforestasi dan efektivitas kawasan konservasi pada landskap yang termodifikasi sangat berat ini mengkonfirmasi adanya kebutuhan yang mendesak untuk melakukan penguatan di sekitar kawasan konservasi baik di tingkat lokal maupun global pada wilayah yang ditujukan untuk produksi sawit. Aksi-aksi tersebut sangat dibutuhkan untuk mendukung perlindungan flora dan fauna endemik di dunia.

Keyword: Deforestation; Palm oil; Generalized boosted regression models; Protected areas; Statistical matching; Sumatra; Tiger

30. Trade-related water scarcity risk under the Belt and Road Initiative / Wang, Liping; Li, Yashuai; Liang, Sai; Xu, Ming; Qu, Shen. Science of The Total Environment30. ISSN: 0048-9697 (2021) v.801 Issue. p.149781. 801

Url: https://www.sciencedirect.com/science/article/pii/S0048969721048567

DOI: 10.1016/j.scitotenv.2021.149781

Abstract: Increasing trade cooperation under the Belt and Road (B&R) Initiative has promoted economic development and intensified the water scarcity risk transmission between China and countries along the route (B&R countries). Local water scarcity risk (LWSR, the potential direct production losses induced by local water scarcity) can transcend geographical boundaries through global supply chains and influence production activities in downstream economies. To understand the vulnerability of the Initiative to water scarcity, we investigated the impacts of LWSR in China and B&R countries on each other's economies during 2001-2013, using a global environmentally extended multi-regional input-output model. Results reveal that more than 80% of China's trade-related water scarcity risk imports (TWSR imports, the vulnerability to foreign water scarcity risk through imports) originates from B&R countries. The share of TWSR from China in total imports of B&R countries has steadily increased. In particular, India, Thailand, Iran, Pakistan and Kazakhstan have the largest TWSR exports (LWSR in each nation transmitted to other nations through its exports) to China, while South Korea, Thailand, Malaysia, Singapore and Indonesia have the largest imports from China. Water scarcity to their Agriculture sectors is responsible for TWSR transmission between them. Our study can contribute to the policy-making of governments and firms involved in mitigating the supply chain wide water scarcity risk. It also reveals the need for nations to collectively manage water resources to achieve sustainable development.

Keyword: Input-output analysis; Supply chain risk; The Belt and Road Initiative; Water scarcity

31. Changes in adolescent smoking with implementation of local smoke-free policies in Indonesia: Quasi-experimental repeat cross-sectional analysis of national surveys of 2007 and 2013 / Septiono, Wahyu; Kuipers, Mirte A.G.; Ng, Nawi; Kunst, Anton E.. Drug and Alcohol Dependence31. ISSN: 0376-8716 (2020) v.209 Issue. p.107954. 209

Url: https://www.sciencedirect.com/science/article/pii/S0376871620301198

DOI: 10.1016/j.drugalcdep.2020.107954

Abstract: Background Banning smoking from public places may prevent adolescent smoking, but there is little evidence on impact of smoke-free policies (SFPs) from low and middle-income countries. This study assessed to what extent the adoption of local SPFs in Indonesia between 2007 and 2013 associated with adolescent smoking. Methods Data on 239,170 adolescents (12–17 years old) were derived from the 2007 and 2013 national health surveys in 497 districts and 33 provinces. This study compared 2013 survey respondents living in districts/provinces that adopted SFPs between 2007 and 2013, with 2007 respondents and 2013 respondents in districts/provinces that did not adopt policies. Multilevel logistic regression analysis assessed whether SFP was associated with daily and non-daily smoking. We controlled for survey year, SFP in 2007, socio-demographics, and district characteristics. Results Strong district SFPs was significantly associated with lower odds of daily smoking (OR:0.81, 95 %CI:0.69-0.97), but non-significantly with non-daily smoking (OR:0.89, 95 %CI:0.76-1.05). Strong provincial SFPs was not associated with daily smoking (OR:1.02, 95 %CI:0.84–1.25), but was associated with higher odds of non-daily smoking (OR:1.22, 95 %CI:0.99-1.51). Moderately strong SFPs did not consistently show associations in the same direction. For example, moderately strong provincial SFP was associated with higher odds of daily smoking (OR:1.27, 95 %CI:1.11-1.46) and lower odds of non-

daily smoking (OR:0.82, 95 %CI:0.72-0.93). Conclusion We did not detect a consistent short-term effect of district and province-level smoke-free policies on adolescent smoking in Indonesia. Weak implementation and poor compliance may compromise effectiveness, which would call for improvement of SFP implementation in Indonesia.

Keyword: Indonesia; Adolescents; Smoke-Free policy; Smoking; Smoking prevalence; Youth

32. Global disparity in public awareness of the biological control potential of invertebrates / Wyckhuys, K.A.G.; Pozsgai, G.; Lovei, G.L.; Vasseur, L.; Wratten, S.D.; Gurr, G.M.; Reynolds, O.L.; Goettel, M.. Science of The Total Environment32. ISSN: 0048-9697 (2019) v.660 Issue. p.799-806. 660

Url: https://www.sciencedirect.com/science/article/pii/S0048969719300841

DOI: 10.1016/j.scitotenv.2019.01.077

Abstract: Invertebrates make up over 95% of animal biodiversity on Earth and contribute to multiple ecosystem services (ES) in natural and human-dominated systems. One such service, biological control (BC) of herbivorous pests, is a core component of sustainable intensification of agriculture, yet its importance is routinely overlooked. Here we report a macro-scale, cross-cultural assessment of the public visibility (or 'salience') of BC invertebrates, using high-throughput analysis of large bodies of digitized text (i.e., 'culturomics'). Using binomial scientific name frequency as proxy for visibility, we compared the extent to which a given species featured in webpages within either scientific media or the entire worldwide web, and in total search volume at varying spatial scale. For a set of 339 BC invertebrate species, scientific and internet coverage averaged 1020 and 1735 webpages, respectively. Substantial variability was recorded among BC taxa with Coleoptera, Hemiptera and Nematoda having comparatively high visibility. Online visibility exhibited large geographical variability ranging from France covering BC invertebrates on average in 1050 webpages versus Thailand or Indonesia on just 31–38. This work represents the first extensive use of culturomics to assess public visibility of insect-mediated ES. As BC uptake is dictated by stakeholders' access to (agro-ecological) information, our work identifies geographically-delineated areas that are differentially attuned to the concept of invertebrate BC, pinpoints opportunities for focusing education campaigns and awareness-raising, enables real-time tracking of BC public appeal, and informs public policy.

Keyword: Agro-ecology; Big data; Computational science; Ecological intensification; Ecosystem services; Functional biodiversity; Pest management; Public perception

33. Forests, fuelwood and livelihoods—energy transition patterns in eastern Indonesia / Lee, Soo Min; Kim, Yeon-Su; Jaung, Wanggi; Latifah, Sitti; Afifi, Mansur; Fisher, Larry A.. Energy Policy33. ISSN: 0301-4215 (2015) v.85 Issue. p.61-70. 85

Url: https://www.sciencedirect.com/science/article/pii/S0301421515001809

DOI: 10.1016/j.enpol.2015.04.030

Abstract: The central thesis of the energy ladder model is a unidirectional transition from primitive to advance fuel with increased affluence of households. Although now largely discredited, this

assumption remains a foundation of laissez-faire policies that anticipate energy transition resulting spontaneous forest recovery with economic development. Our results suggest that such policies can undermine broader policy objectives and actually worsen forest conditions in rural Indonesia. Based on a case study of forest margin communities in eastern Indonesia, we demonstrate that fuel subsidy reform did little to reduce rural household demand for fuelwood, while dramatically increasing fuelwood demand for processing agricultural products. Our results show how household decisions related to fuel sources are affected by non-economic considerations and external factors, such as opportunities to sell fuelwood. We argue that policy interventions that encourage energy transition of households do not necessarily improve forest conditions, as household fuelwood use may be a symptom, rather than a driver of deforestation and forest degradation. Thus policies to improve forest conditions should focus more on addressing the market environment of forest-margin communities, providing energy alternatives to small industries that are often the larger consumers of fuelwood.

Keyword: Indonesia; Energy stacking; Energy transition; Forest management; Fuelwood; Tobacco curing

34. Assessing future land-uses under planning scenarios: A case study of The Brantas River Basin, Indonesia / Wiwoho, Bagus Setiabudi; McIntyre, Neil; Phinn, Stuart. Environmental Challenges34. ISSN: 2667-0100 (2024) v.15 Issue. p.100873. 15

Url: https://www.sciencedirect.com/science/article/pii/S2667010024000398

DOI: 10.1016/j.envc.2024.100873

Abstract: Understanding land-use dynamics and patterns and how they respond to management scenarios helps to develop sustainable land use policies. This study simulated future land uses in Brantas River Basin (BRB), East Java, Indonesia using Land Change Modeler (LCM) under policy scenarios. Following identification of twelve important biophysical and socio-economic spatial drivers, the LCM accurately simulated land-use changes over the period 1995–2015, with validation against the 1995 land use map giving an overall accuracy of 85–88 %. Under a business-as-usual scenario, the LCM predicted that during the period 2015 to 2035 continuing deforestation may leave forest cover accounting for only 4 % of the total BRB area, and cause declines in dryland from 45 % to 40 % and in rice-field farming from 24 % to 22 %. The results of that scenario also indicate the prospect of massive urban development, increasing from 18 % of the BRB area in 2015 to 30 % in 2035, with increasing threats to food security and water resources. Both percentage changes and a mean-weighted fractal dimension index suggest increased risks of forest fragmentation and urban aggregation. A spatial planning-influenced scenario, which aims to reduce forest loss and support watershed protection, is predicted to lead to 5.5 % forest cover, 37 % dryland, 29 % rice-field farming and 24 % urban area in 2035. Sensitivity analysis of the LCM showed that the model results were more sensitive to drivers, spatial resolution, and policy scenarios than to uncertainty in model parameters. It is concluded that despite some limitations, the LCM successfully provided" insights into policy impacts on land-uses in BRB, and the roles of forest and rice-field protection in spatial planning are essential in controlling urban development for watershed sustainability.

Keyword: Brantas River Basin; Land-use change; Landscape metrics; Spatial uncertainty

35. Missing the forest for the data? Conflicting valuations of the forest and cultivable lands / Cheyns, Emmanuelle; Silva-Castañeda, Laura; Aubert, Pierre-Marie. Land Use Policy35. ISSN: 0264-8377 (2020) v.96 Issue. p.103591. 96

Url: https://www.sciencedirect.com/science/article/pii/S0264837717309249

DOI: 10.1016/j.landusepol.2018.08.042

Abstract: In reaction to Greenpeace campaigns denouncing the impact of oil palm plantations in Southeast Asia, Golden Agri-Resources (GAR) – a major actor in the palm oil sector – adopted a zero-deforestation policy. The implementation of this policy raised a simple, albeit tricky, question: what is a forest? In response, Greenpeace, GAR and a consultancy firm developed a methodology for forest classification called the High Carbon Stock (HCS) Approach. Employing a vegetation classification based primarily on a threshold of carbon sequestration, the method identifies which forested zones to protect from conversion to agriculture. While currently gaining resonance in the realm of sustainability standards, its implementation in Indonesia and Liberia encountered resistance and criticism by rural dwellers and social NGOs. How did HCS advocates integrate local peoples' concerns, interests and claims to compose commonality? By analysing the HCS methodology's content, implementation and progressive adaptation, this article shows how HCS advocates favoured a specific mode of composition: one that fits a liberal grammar and that has specific implications on the valuation of forest and cultivable lands. The HCS approach is thus more than a data collection tool; it encapsulates and reinforces a particular vision of the environment and how people should relate to it.

Keyword: Oil palm; Forest conservation; Environmental valuation; High carbon stock; Local communities; Pragmatic sociology

36. Public and private sector zero-deforestation commitments and their impacts: A case study from South Sumatra Province, Indonesia / Purnomo, Herry; Okarda, Beni; Puspitaloka, Dyah; Ristiana, Nurindah; Sanjaya, Made; Komarudin, Heru; Dermawan, Ahmad; Andrianto, Agus; Kusumadewi, Sonya D.; Brady, Michael A.. Land Use Policy36. ISSN: 0264-8377 (2023) v.134 Issue. p.106818. 134

Url: https://www.sciencedirect.com/science/article/pii/S0264837723002843

DOI: 10.1016/j.landusepol.2023.106818

Abstract: In Asia, Africa, and Latin America, complex drivers of deforestation have sparked mandatory and voluntary initiatives, including moratorium policies, zero-deforestation pledges and certification systems. The impacts of these different commitments, which aim to reduce deforestation, have yet to be documented or analytically scrutinized. Using South Sumatra as a case study, we used the Institutional Analysis and Development (IAD) framework to identify the context and impacts of public and private sector commitments. Public sector commitment was assessed by examining political will reflected in government policies and regulations, while private sector commitment was assessed by looking at compliance with mandatory and voluntary certification schemes. South Sumatra lost 63% of its natural forest between 1990 and 2019. Deforestation is driven by expansion of large-scale commercial plantations, as well as illegal logging and clearing. Our study indicates that public and private sector commitments do matter. Statistically, we found sufficient evidence that private sector

commitments were able to significantly reduce deforestation from year of commitments to 2019, at a 90% confidence level. Efforts to support zero-deforestation commitments must involve radical shifts in current policy and practice, with stricter law enforcement to combat illegal activities, greater transparency to inform progress, and the development of strategic and actionable plans.

Keyword: Deforestation; Institutional Analysis and Development (IAD) framework; Public and private sector; Zero-deforestation commitment

37. Meta-data analysis of biofuels in emerging markets of Africa and Asia: Greenhouse gas savings and economic feasibility / Leal Silva, Jean Felipe; Nogueira, Luiz Augusto Horta; Cantarella, Heitor; Rossetto, Raffaella; Maciel Filho, Rubens; Souza, Glaucia Mendes. Renewable and Sustainable Energy Reviews37. ISSN: 1364-0321 (2025) v.213 Issue. p.115465. 213

Url: https://www.sciencedirect.com/science/article/pii/S1364032125001388

DOI: 10.1016/j.rser.2025.115465

Abstract: The transportation sector is a key contributor to global greenhouse gas emissions (GHG). Despite the potential of electrification in decarbonizing this sector, fleet renewal will produce effects only in the long term and this solution is still costly, especially for developing countries. In contrast, biofuels represent a mature technology for managing GHG emissions in transportation, and its production is especially interesting in regions where it can bring agricultural development. This work presents harmonized life cycle assessment and techno-economic analysis of the expansion or implementation of biofuel blending mandates in China, Ethiopia, India, Indonesia, Malaysia, South Africa, and Thailand, considering 23 biofuel pathways (biodiesel and ethanol) with feedstock choice and productivity varying according to country conditions. The global warming potential of biofuels was significantly lower than that of fossil fuels. The lowest reductions were observed in biofuels whose agricultural or industrial phases are heavily dependent on fossil resources (coal-based ammonia for nitrogen fertilizer or coal/gas as an energy source in industry). Among the 23 options, 18 were selected for a market analysis that showed a decrease in the energy cost of fuel for all countries except China and Malaysia, where feedstock cost and fossil fuel subsidies are issues. Biofuels can reduce GHG emissions in the transportation sector by up to 17 % using a 25 % blending mandate. Based on this harmonized approach, it was possible to compare the potential of biofuels in emerging markets and to provide recommendations for research and policy development.

Keyword: Biodiesel; Bioenergy; Decarbonization; Ethanol; LCA

38. Will the EU deforestation-free products regulation (EUDR) reduce tropical forest loss? Insights from three producer countries / Muradian, Roldan; Cahyafitri, Raras; Ferrando, Tomaso; Grottera, Carolina; Jardim-Wanderley, Luiz; Krause, Torsten; Kurniawan, Nanang I.; Loft, Lasse; Nurshafira, Tadzkia; Prabawati-Suwito, Debie; Prasongko, Diaz; Sanchez-Garcia, Paula A.; Schröter, Barba. Ecological Economics38. ISSN: 0921-8009 (2025) v.227 Issue. p.108389. 227

Url: https://www.sciencedirect.com/science/article/pii/S0921800924002866

DOI: 10.1016/j.ecolecon.2024.108389

Abstract: The European Union regulation on deforestation-free products (EUDR) represents a policy innovation with important implications for the governance of global commodity chains. We discuss the risks and limitations of this policy derived from an ex-ante assessment of the robustness of its theory of change. For doing so, we use insights from the literature on zero-deforestation commitments and other private standards in value chains and from trade and deforestation patterns in three relevant producer countries (Brazil, Colombia and Indonesia). Despite the potentially positive symbolic effect in mobilizing a global agenda for combating deforestation, the EUDR faces several drawbacks and risks associated with three of its constitutive features: To be demand-oriented, having the value chain as the unit of intervention and holding a high degree of unilateralism. We conclude that to be effective in curbing tropical deforestation, the Regulation must be complemented with international cooperation aiming to strengthen national policies with a territorial approach, as well as social movements addressing the underlying causes of forest loss and human rights violations in the territories where it takes place.

Keyword: European Union; Biodiversity; Commodities; Deforestation-free; EUDR; Forests; Trade

39. Automatic deforestation driver attribution using deep learning on satellite imagery / Ramachandran, Neel; Irvin, Jeremy; Sheng, Hao; Johnson-Yu, Sonja; Story, Kyle; Rustowicz, Rose; Ng, Andrew Y.; Austin, Kemen. Global Environmental Change39. ISSN: 0959-3780 (2024) v.86 Issue. p.102843. 86

Url: https://www.sciencedirect.com/science/article/pii/S0959378024000475

DOI: 10.1016/j.gloenvcha.2024.102843

Abstract: Deforestation is a leading contributor to greenhouse gas emissions globally. Understanding the direct drivers of forest loss is essential for developing targeted forest conservation and management policies. However, this data is hard to collect at scale due to the complexity of forest loss drivers and expertise required for accurately identifying them. To address this challenge, we developed a deep learning model called ForestNet which uses publicly available satellite imagery to automatically classify the drivers of primary forest loss. We validated ForestNet on a test set of expert-annotated forest loss events and showed that ForestNet achieved high performance across four major driver classes. We used ForestNet to identify these drivers on over 2 million forest loss events in Indonesia between 2012 and 2019, with significant improvement in spatial and temporal resolution over previously available data. We found that plantations and smallholder agriculture were the primary direct drivers of deforestation in Indonesia during this period, accounting for 64 % of total forest loss. Deforestation has decreased steadily since 2012 after increasing steadily from 2001 to 2009 and peaking from 2009 to 2012, trends that we found are primarily due to changes in plantation-driven deforestation. Our approach can serve as a general framework for scalably attributing deforestation to specific drivers and can be extended to other regions of interest, providing a flexible and cost-effective way for countries to regularly monitor, understand, and address their unique and dynamic drivers of deforestation.

Keyword: Deforestation; Sustainability; Agriculture; Deep learning; Machine learning

40. Influence of childhood experiences on walking behavior during adulthood: Long-term panel data analysis / Widita, Alyas A.. Travel Behaviour and Society40. ISSN: 2214-367X (2025) v.38 Issue. p.100893. 38

Url: https://www.sciencedirect.com/science/article/pii/S2214367X2400156X

DOI: 10.1016/j.tbs.2024.100893

Abstract: While a substantial body of literature exists on the factors associated with walking behavior, little is known about the long-term effects of childhood experiences. This study utilizes micro-longitudinal data from the Indonesian Family Life Survey (IFLS) to track the lives of 1,343 Indonesians from childhood to adulthood. Findings from a series of regression analyses provide suggestive evidence of the relative importance childhood experiences play in shaping walking behavior during adulthood. Specifically, exposure to a dense urban environment during childhood appears to increase the likelihood of developing sustained walking behavior in later life. Additionally, our findings reveal that individuals raised in households with lower vehicle ownership are more likely to maintain walking behavior during adulthood compared to otherwise similar individuals from households with higher vehicle ownership. In summary, this study highlights the potential long-term efficacy of spatial planning strategies and transportation policies in fostering a more sustainable travel pattern.

Keyword: Indonesia; Childhood experiences; Longitudinal data; Walking behavior

41. Palm oil-based bioenergy sustainability and policy in Indonesia and Malaysia: A systematic review and future agendas / Papilo, Petir; Marimin, Marimin; Hambali, Erliza; Machfud, Machfud; Yani, Mohamad; Asrol, Muhammad; Evanila, Evanila; Prasetya, Hermawan; Mahmud, Jaizuluddin. Heliyon41. ISSN: 2405-8440 (2022) v.8 Issue. 10p.e10919. 8

Url: https://www.sciencedirect.com/science/article/pii/S2405844022022071

DOI: 10.1016/j.heliyon.2022.e10919

Abstract: This paper reviews previous research on the sustainability and policies of palm oil-based bioenergy in Indonesia and Malaysia. A systematic literature review with a meta-analysis (PRISMA) methodology was performed to evaluate the related articles discussing sustainability and bioenergy policies. This study found 96 articles that mapped the sustainability and policies of bioenergy in Indonesia and Malaysia over the last decade. The sustainability studies were divided into two areas: the environment and socioeconomics. Researchers were more likely to examine environmental factors than socioeconomic factors, specifically focusing on the following environmental indicators: land use conversion, deforestation, and CO2 emissions. Most policy studies concentrated on sustainability and energy security. Over the last two decades, the development of bioenergy policies in Indonesia and Malaysia has been comparable in terms of geographical position and palm oil production. However, Indonesia's bioenergy policy has tended to be more vigorous and dynamic than Malaysia.

Keyword: Indonesia; Deforestation; Environmental indicators; Malaysia; Policies; Socioeconomic indicators

INDEKS PENGARANG

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