

A systematic review of the diverse values of Seagrass Contributions to People (SCP) in Indonesia: A pilot study

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Supplementary Material

Supplementary Material 1 List and description of seagrass ecosystems' contribution to people (SCP) from Mckenzie et al. (2021), derived from concepts of ecosystem service (de Groot et al., 2002; Nordlund et al., 2016) and the Nature's Contributions to People (Diaz et al., 2018). Names inside brackets in SCP categories indicate their shortened versions for plots' conveniences.

SCP categories	Description	Specific search string
Material		
Bioindicator	Seagrass characteristics ecosystems are assessed as a part of coastal ecosystem health indicators	Indicat* OR "health status"
Compost fertilizer (Fertilizer)	Seagrass biomass and/or wracks are harvested for enriching the soils of land crops	Fertiliz* OR compost
Human Diet	Parts of the plant are consumed for human food	diet* OR food
Genetic	genetic information and/or micro-scale studies of seagrass	gene* OR genetic
Food for detritivores and filter feedes (Food for detritivores)	Food for detritivores, such as sea cucumbers, microorganisms, and microbes	"filter feed* OR benth*
Foor for herbivores	Food for herbivorous fish, dugongs, and sea turtles	Herbivor* OR dugong
Gleaning	Seagrass fishery that involves catching with bare hands and/or tools during low tides	Glean*
Mariculture	Meadow substrates as an aquaculture component	Seaweed OR aquaculture
Nursery	Habitats for coastal biota spawn and/or juvenile growth, particularly fishes	Nursery OR juvenile
Ornamental resources	Seagrass plants and/or associated biota are harvested as ornaments	Ornament*
Pharmaceuticals	Seagrass plants or their extracts contain compounds for physiological and/or mental health remedies	Medicine OR pharmaceutical
Raw material	Seagrass plants are used for construction material	Fibre OR "raw material"
Fishery	Seagrass ecosystems as fishery sites for human provision	Fishery*
Stock feed	Live and/or wrack biomass as livestock foods	livestock OR farm
Trophic subsidy	Biota from adjacent ecosystems (e.g. mangroves, coral reefs) utilize seagrass ecosystems as hunting and/or spawning grounds	"coral reef fish*" OR "mangrove fish"

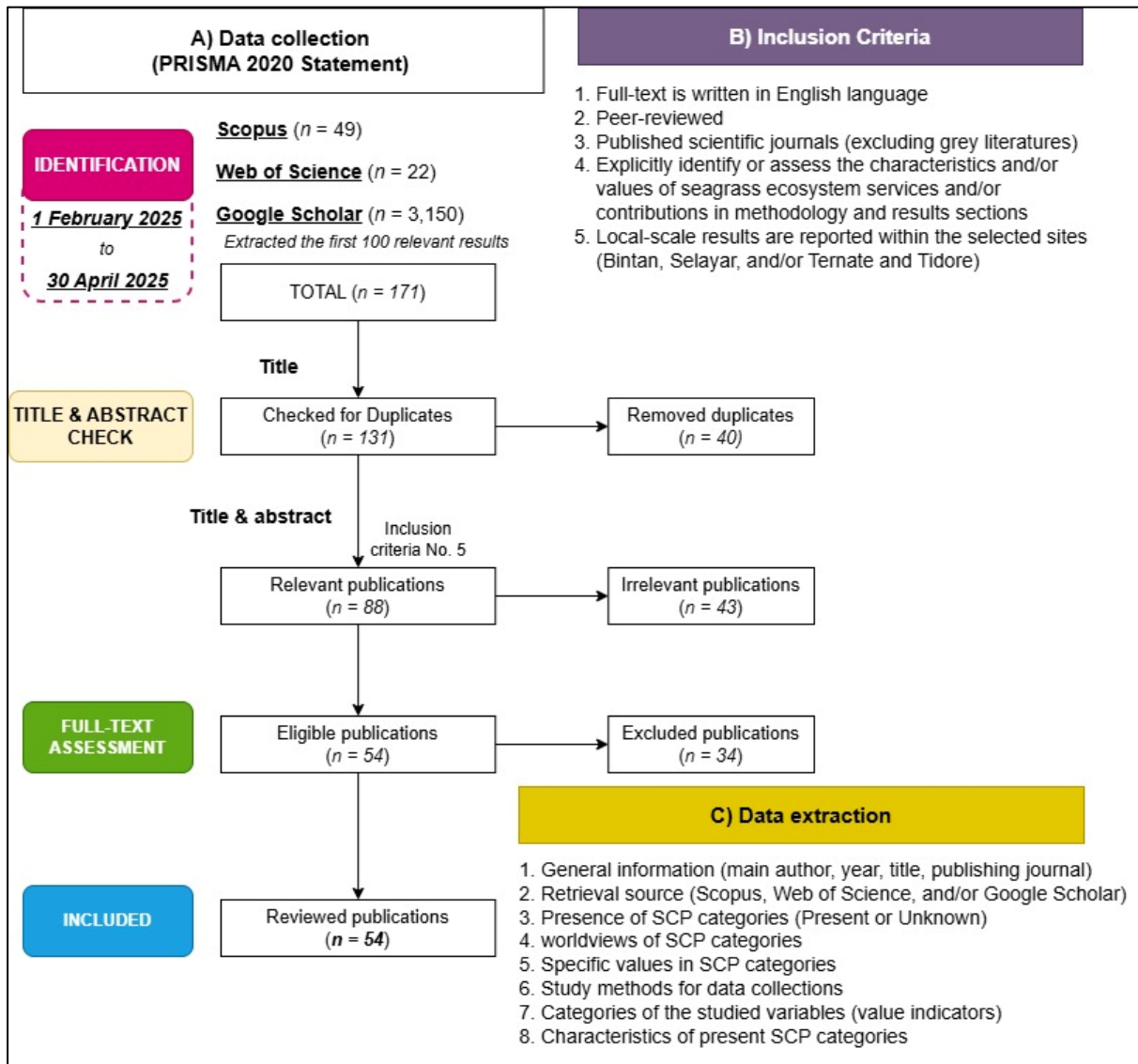
Supplementary Material 1. (continued)

SCP categories	Description	Specific search string
Regulating		
Carbon sequestration	Blue carbon; Climate regulation through long-term removal of greenhouse gasses	“carbon stock” OR “carbon sequestration”
Natural hazard regulation (Nat. Haz. Reg.)	Seagrass meadow dissipates damaging hydrodynamics from storms and waves towards coastal areas	“coast* protect*”
Regulates ocean acidification (Reg. Ocean Acid.)	Seagrass ecosystem increases pH and calcification	“ocean acidification” or pH
Sediment stabilization	Seagrass meadow stabilizes coastal sediments, reduces erosion and promote sedimentation	Sediment* OR accretion
Water purification	Water quality regulation by buffering nutrients; lowering turbidity	“water quality” OR turbid*
Disease regulation	Precipitate harmful microbes to humans and corals	Disease OR virus
Non-material		
Bequest	Satisfactory expressions induced by preserving seagrass ecosystems for upcoming generations	Conservation OR restoration
Aesthetic	Seagrass ecosystems are viewed through beauty and aesthetic values	Aesthetic OR scene*
Cultural artifacts	Seagrass meadow buries and protects archaeological artifacts	Artifact OR indigenous
Education	Seagrass ecosystems are used as an education environment and/or subject	Education OR train*
Inspiration	Seagrass ecosystem and/or biota inspire local artistic designs	Art OR creativ*
Knowledge systems	Indigenous and/or Local Knowledge (ILK) and/or values are present on perceiving seagrass ecosystem and its services	Tradition* OR “local knowledge”
Tourism	Seagrass ecosystem provides a habitat for recreational activities	Touris* OR recreation
Scientific research	Academic research and experiments on the seagrass ecosystem	Research OR monitor*
Sense of place	Seagrass ecosystems as a signature environment for local identity	Identity OR place
Social relations	Seagrass ecosystem services influence the dynamics of social relations between different actors of the community	“social relation” OR community
Spiritual & Religious	Seagrass ecosystems are perceived by spiritual and religious values	Spirit* OR belief*

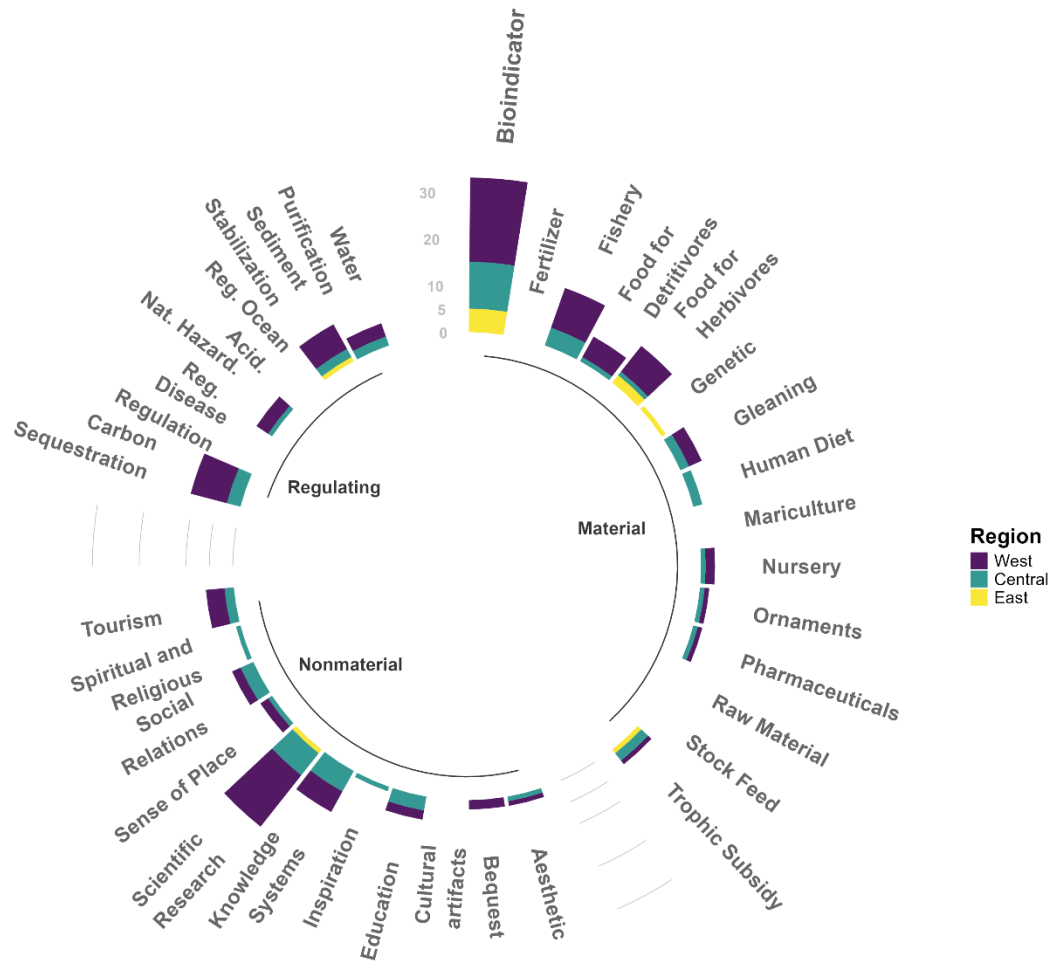
Supplementary Material 2 Salient articulations of worldviews, specific values, and value indicators categories, in accordance with the IPBES conceptualizations on the diverse values of nature (Anderson et al., 2022; IPBES, 2022; Pascual et al., 2023). Definitions of specific values are derived from core meanings developed by Himes et al. (2023, p. 30).

Worldviews		
Anthropocentric	Ecocentric	Pluricentric
Human aspects were prioritised, conceiving nature as a stock and their benefits flow for human utilisation	Respecting nature with their intrinsic rights as other-than-human entity, emphasizing their inherent values regardless of human’s perspective.	Reciprocal and interdependent relationships between human and other-than-human beings.
Specific Values		
Instrumental	Intrinsic	Relational
“The value of nature entities and other-than-human beings important as means to achieve human ends or satisfy human preferences”. Strongly associated with anthropocentric worldviews and utilitarianism.	“Values of nature (other-than-humans) expressed independently of any reference to people as valuers”. Strongly associated to ecocentric worldviews.	“Values of meaningful and often reciprocal human relationships—beyond means to an end—with nature and among people through nature”. Strongly associated with pluricentric worldviews and stewardship.
Value Indicators		
Biophysical	Monetary	Socio-cultural
Measurements of ecosystem stocks and flows, including genetic diversity, landscape functions and connectivity, and maintenance of options.	Measurement of ecosystem stocks and flows by monetary valuations or preference-based that involves subjective pricing.	Measurement of ecosystem stocks and flows through individual or societal accounts, incorporating knowledge systems.

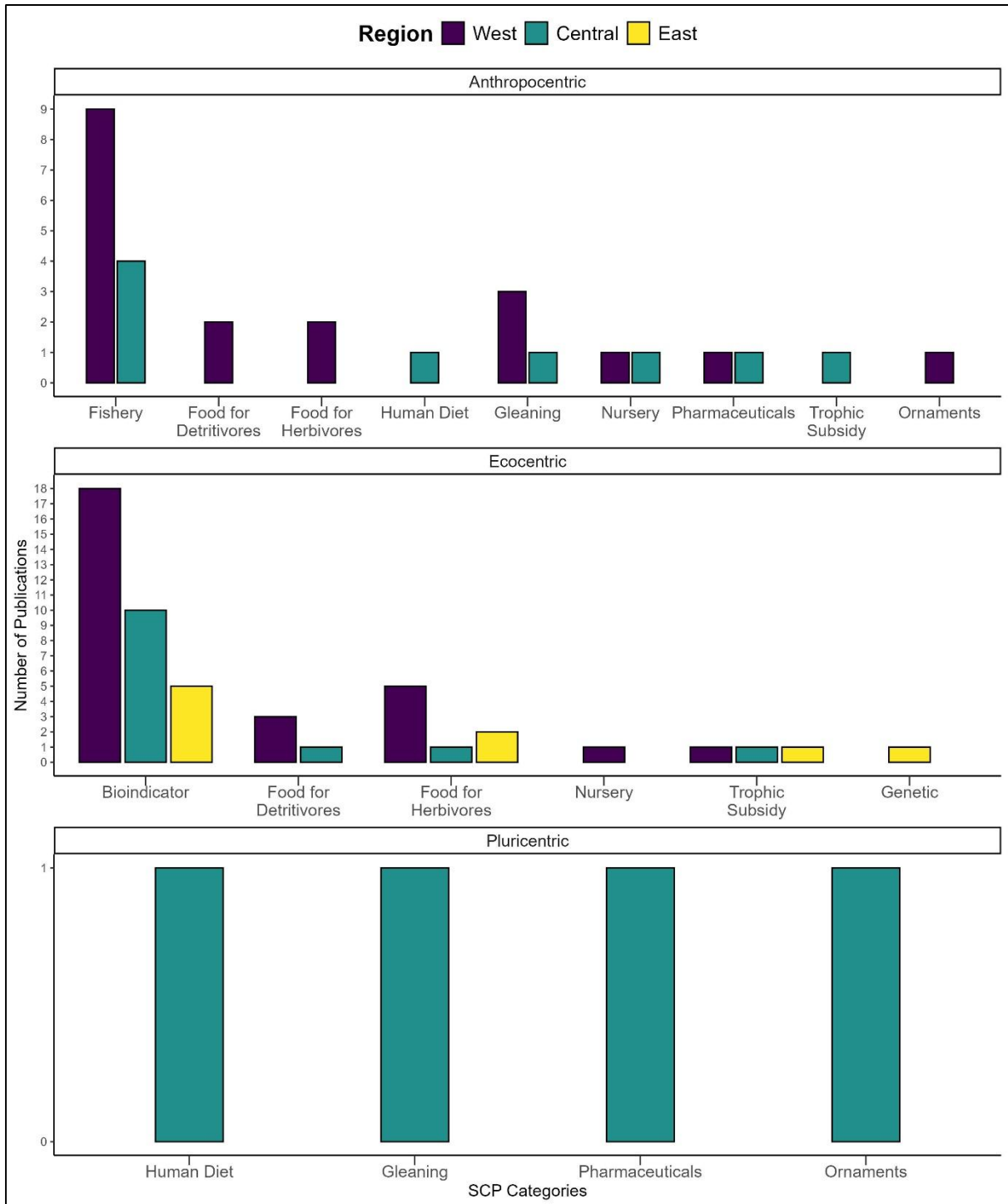
Supplementary Material 3 The systematic review flowchart, consisting of data selection and collection process (A), inclusion criteria for reviewed publications (B), and extracted data items (C). The flowchart was in accordance with the PRISMA 2020 statement (Page et al., 2021).



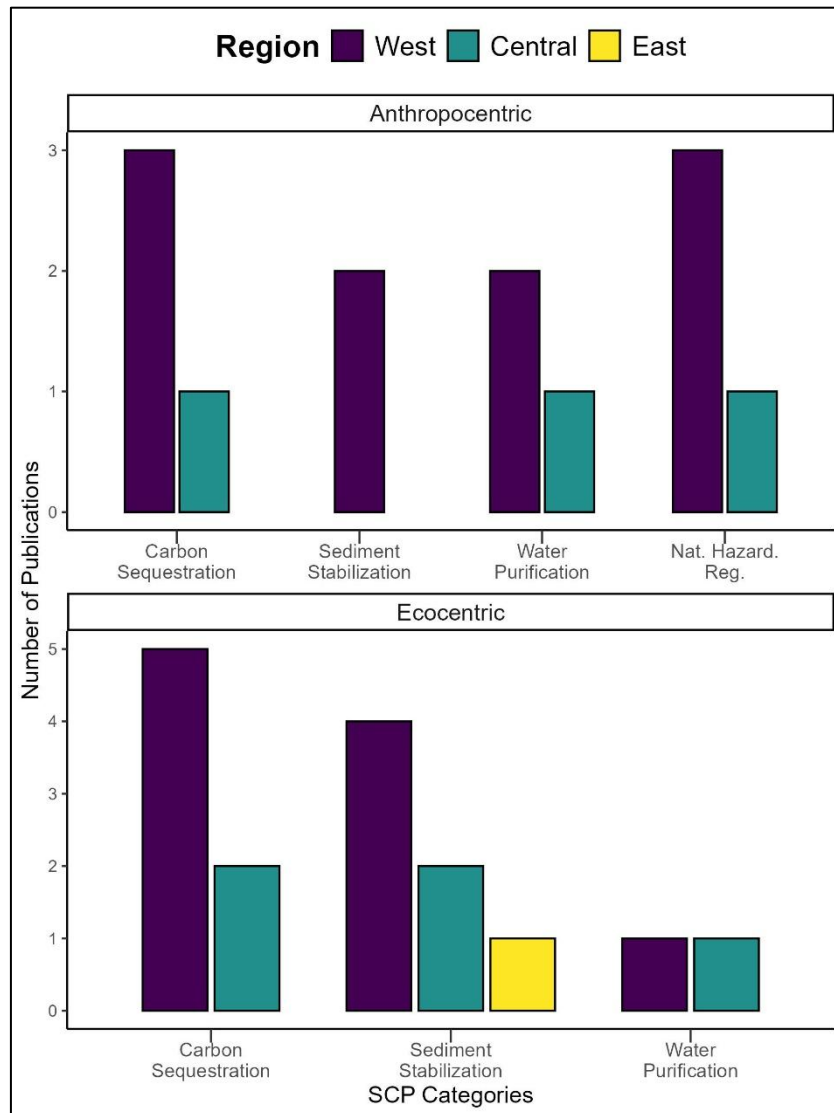
Supplementary Material 4 Total number of publications for every Seagrass Ecosystem Contributions to People (SCP) category among the three study regions (Western, Central and Eastern) in Indonesia.



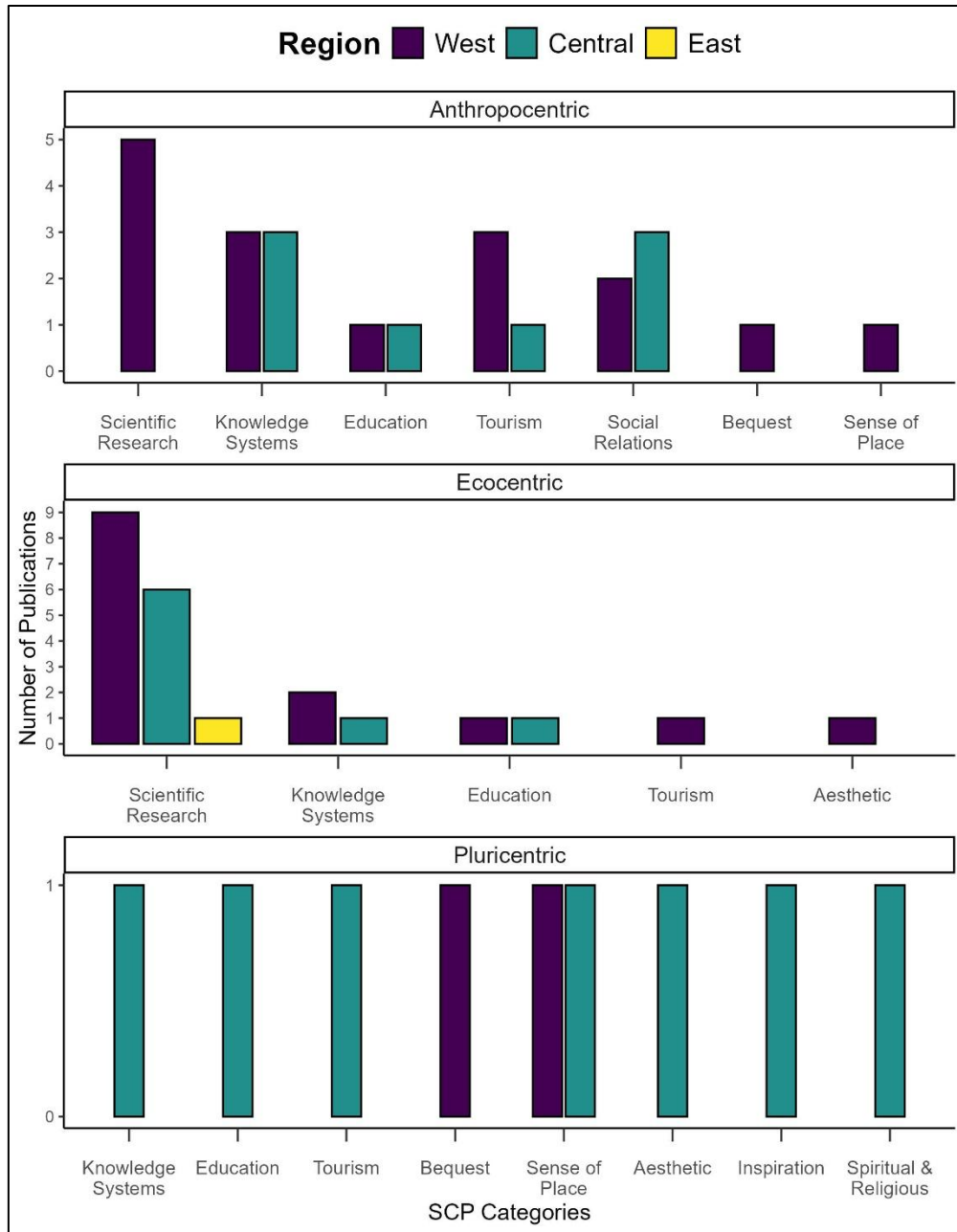
Supplementary Material 5 Frequency distribution of the number of publications identifying different types of worldviews across Seagrass Ecosystem Contribution to People (SCP) categories and study regions in Indonesia.



Supplementary Material 6 Frequency distribution of number of publications reviewing different types of worldviews across regulating Seagrass Ecosystem Contributions to People (SCP) categories and study regions in Indonesia.



Supplementary Material 7 Frequency distribution of number of publications reviewing different types of worldviews across non-material Seagrass Ecosystem Contributions to People (SCP) categories and study regions.



Supplementary Material 8 Prominent examples of overlaps among specific values that creates interaction among SCP categories. Underlined texts demonstrate keywords in the examples that represent the core meanings of all specific values. Bold codes indicate the study regions: Western (W), Central (C), and Eastern (E). Codes for specific values are enclosed in brackets: intrinsic (Intr), instrumental (Inst), and relational (Rel).

Intrinsic-Instrumental		
Study cases	Interacting SCP categories	References
Seagrass as a habitat and feeding ground for dugongs; (W) : conservation for <u>better dugong habitats</u> (Intr), increases <u>tourism values</u> (Inst); (E) : <u>feeding trails</u> as monitoring indicators (Intr, Inst).	Bioindicator, food for herbivores, recreation & ecotourism	Akbar et al. (2021); Rifai et al. (2024); Sjafrie et al. (2024)
(C) : The utilisation of illegal <i>Samba</i> fishing gears to <u>traditionally fish</u> seagrass-associated fishes (Inst), inviting <u>different perspectives</u> between local fishermen and government for its <u>potential damages</u> to seagrasses (Intr).	Seagrass fishery, social relations	Marimba et al. (2019)
Instrumental-Relational		
Study cases	Interacting SCP categories	References
(C) : Gleaning (<i>Ngatti-Ngatti</i>) for catching invertebrates. Perceived as <u>an easy alternative</u> to obtain resources by women, children, and elderly community members (Rel). Catch species for <u>household consumption or market sales</u> (Inst) have <u>local names</u> (Rel), such as <i>Tripneustes gratilla</i> (<i>Tie-Tie</i>).	Gleaning, Knowledge systems, Social relations	Furkon et al. (2020); Nessa et al. (2020)
(C) : Dugong huntings in Selayar island waters for <u>market sales</u> (Inst) are targeting for their tears, believed to be <u>love remedies</u> (Rel).	Fishery, Ornaments, Pharmaceutical, Spiritual & religious	Moore et al. (2017)
Intrinsic-Relational		
Study cases	Interacting SCP categories	References
(W) : Seagrass conservation and rehabilitation programs <u>induced feelings of gratefulness</u> (Rel). <u>Good seagrass quality</u> will influence the whole ecosystem's health (Intr).	Bequest, Recreation & ecotourism	Rifai et al. (2024)
(C) : Educational programs in Jinato Island, Selayar . Dugong awareness campaign <u>reformed local perceptions that dugongs are harmless</u> , not evil entities (Rel), and as a consequence, local communities now <u>protect them</u> (Intr).	Education, Inspiration	Moore et al. (2017)

Supplementary Material 8 (continued).

Intrinsic-Instrumental-Relational		
Study cases	Interacting SCP categories	References
(W): Local community insights on seagrass tourism development. Improving the aesthetics to preserve seagrass ecosystems' <u>pristineness</u> (Intr), <u>providing enjoyment</u> fore future tourists to view exotic species (Rel). <u>Maintaining cleanliness</u> was the most suggested activity to promote tourism (Inst).	Aesthetic, Recreation & ecotourism	Rifai et al. (2024)
(C): The establishment of Taka Bone Rate National Park supported Jinato Island's local communities on establishing marine ecotourisms of dugong sightings that were perceived as benefits for <u>local incomes</u> (Inst), <u>stewardships</u> (Intr), and sightings' <u>enjoyment</u> (Rel).	Sense of Place, Recreation & ecotourism, Education	Moore et al. (2017)

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