

PAPER • OPEN ACCESS

Multi-landscape forest management of small islands in the Moluccas based on green economy

To cite this article: A Kastanya 2019 *IOP Conf. Ser.: Earth Environ. Sci.* **285** 012011

View the [article online](#) for updates and enhancements.

Multi-landscape forest management of small islands in the Moluccas based on green economy

A Kastanya¹

¹Pattimura University, Ambon, Maluku, Indonesia

Corresponding author: aguskastanya@yahoo.com

Abstract. The exploitative and centralistic economic development of Indonesia has had a negative impact on the land, coastal areas and oceans causing poverty in communities. Effects of global warming and climate change require change in the paradigm towards a green economy to prevent a 20 C increase in earth's temperature, which will damage the world and its living creatures. Spatial analysis and Geo Information System (GIS) analysis was used in this research. Operational analysis used the framework of the Integrated Management Model of Small Island Landscape which contains a conceptual, macro and micro framework. The research results require a change from an exploitative economy to a green economy as a basis for policy and renewal of regulations at a central and regional level, in accordance with the eco region's diversity. The macro concept integrates the multi landscape of small islands i.e. the island cluster, the island and its short, narrow watershed, as the management foundation. Integration results show 12 island clusters consisting of 1,340 islands with 1600 water set in the Moluccas. While in North Moluccas there are 8 island clusters, 600 islands and more than 600 watershed. All land use and systems, forest functions, socio-cultural information, tenancy and native title rights have already been integrated into the watershed of the islands and island clusters. The micro concept details sustainable management of forests and other land use areas into management units based on the agroforestry landscape so each multi landscape unit achieves sustainability and community prosperity.

1. Introduction

Global warming and climate change have already had an impact on people and biodiversity worldwide as a result of an exploitative world economy, which has not taken into account the degradation of natural resources and forests, deforestation or the environment. Indonesia, an archipelago which is very vulnerable to global climate change, has already committed to a reduction in emission gases of 26% on its own and as much as 41% with outside help from Business As Usual (BAU) by 2020. In fact it will endeavour to increase the reduction to 29% by 2030. The reduction in greenhouse gases within the green economy concept must be implemented across all development sectors. Particularly in the land use sector, the UNFCCC decision about REDD+ (reducing emission from deforestation and degradation) which has been planned and developed to become the primary direction in development concepts in Indonesia ([8]; [2]; and [4]. The centralistic and exploitative economic development in Indonesia has resulted in damage to the landscape of the land, coast and sea and caused poverty in communities. The impact of global warming and climate change requires a change towards a green economy, especially for the small island region of the Moluccas.



2. Methodology

2.1. Study site and materials

This research was conducted in the Moluccas (Maluku) archipelago which had been one province until 1999 when it was divided into – Maluku Province and North Maluku Province. Before this division, the province of Maluku had been structurally planned as eight island groups as shown in the map in figure 1.

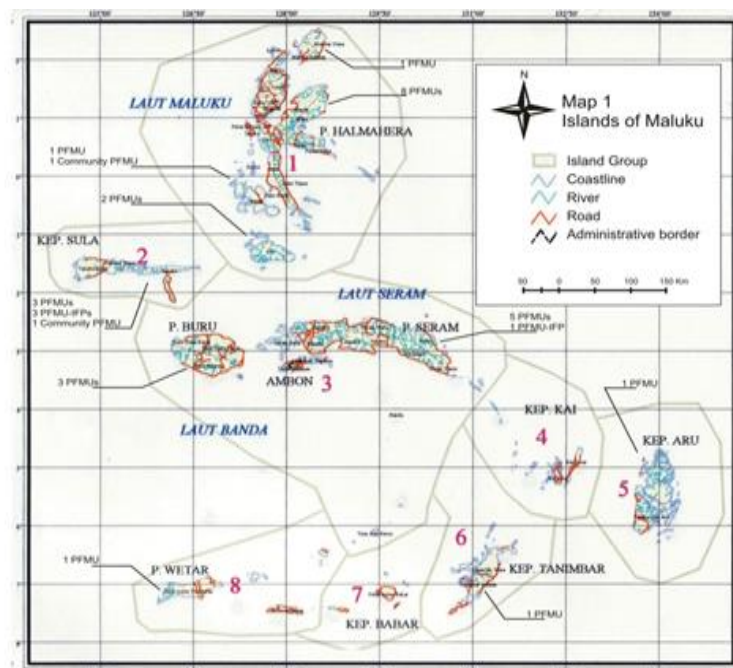


Figure 1. Map of island groups in Mollucas Archipelago as study site

The Maluku archipelago as shown in figure 1 consists of eight island clusters – 1 and 2 are in North Maluku Province and clusters 3-8 are in Maluku province. After the separation into two provinces, Maluku province was developed into twelve island clusters and in North Maluku province there were 8 development regions based on the same principle of island clusters.

Material and data used in this research came from the Regional Development Plan document, District Structural Plan (Province/regency/town) and Watershed. Apart from these, other sources included sectoral planning such as forest and agricultural land use, regional action plan for greenhouse gases, planning concept for forest management units and thematic maps.

2.2. Data Analysis

Spatial analysis and Geo Information System (GIS) analysis was used in this research. Operational analysis used the framework of the Integrated Management Model of Small Island Landscape ([6]; [7]; [8]) which contains a conceptual, macro and micro framework, as shown in figure 2.

Figure 2 is the integrated analysis framework and includes the conceptual framework as well as the macro and micro frameworks. The conceptual framework analyses the basic policy of the central body and the region to ensure conformity in the policy in order to achieve sustainability in management of the multi landscape within the macro and micro framework as well as conservation of the landscape at ground level and generational affluence. Landscape is a social and ecological system consisting of the natural ecosystem and/or an ecosystem modified by man, which has been influenced by different ecological, historical, political, economic and cultural activities [12]. The arrangement of the space and the management structure of the landscape contribute to its unique character [1].

The small islands in Maluku have a multi landscape as island clusters consisting of groups of islands and each island are split up into watersheds. Within each watershed are landscape units based on the ecological, economic political and socio-cultural conditions present.

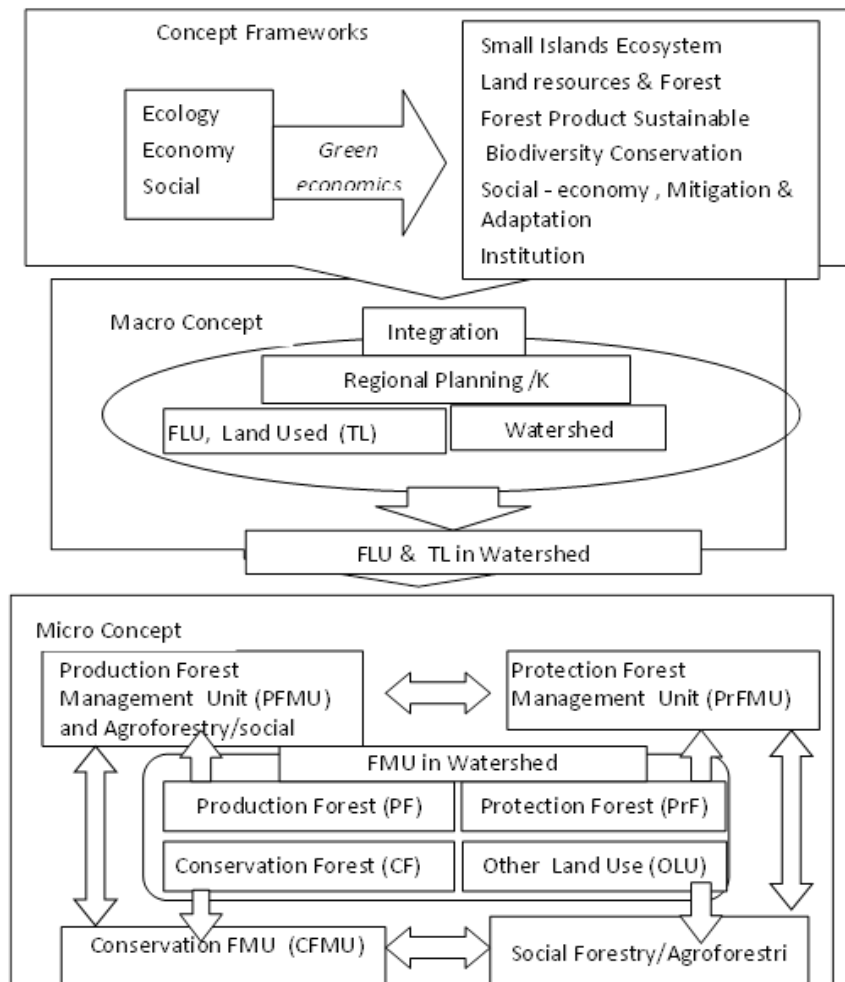


Figure 2. Small islands Multi Landscape

3. Results and Discussions

3.1. Conceptual Development Framework for Indonesia towards a green economy

The research results require a change from an exploitative economy to a green economy as a basis for policy and renewal of regulations at a central and regional level, in accordance with the eco region's diversity. National development policies along with development at the level of the province, regency, town and grass roots are still very sectorial and create tenurial problems in many regions (see [11]; [5]). This is obvious from the regulations and structuring of national institutions down to the lowest level. The economic system which has been developed is a system based on exploitation of both renewable and non-renewable natural resources.

Policies and laws are still sector based, as are national executive and legislative organisations from the central level right down to a regional level so it is difficult to achieve cohesiveness as means of ensuring conservation, development and community affluence for the future. This situation also has triggered the development of an exploitative economy as seen by the amount of degradation of natural

resources in all development sectors. It has also lead to an increase in emission gases resulting in a rise in the earth's temperature and to global climate change which has had a destructive impact across Indonesia.

Long-term national development planning for a 25-year period became the basis for the direction of national development; this was then broken down into 5-year plans, which are currently in the 4th stage (2015-2019). However, at a regional level, it is still difficult to achieve a reduction in the degradation of natural resources and emission gas levels continue to rise despite policies and the intervention of international politics in most countries including in Indonesia. Long-term policies and international politics about containing climate change at the Conference of Parties 21 in Paris (Paris Agreement), have determined the importance of limiting a 2^o C temperature rise to even 1.5^o C by 2030-2050. In comparison to the pre-industrial era, this requires fundamental and innovative efforts by all policy makers and must be supported by national and regional politics.

The Maluku Province was divided in 1999 into Maluku Province and North Maluku Province. Maluku province has specific characteristics; it consists of 1,340 islands with an area of 712,479.65 km²; a land area of 54,185 km²; a sea area of 658,294.69 km² and a coastline 10,622 km long. North Maluku province has an area of 140,255.36 km² which includes 106,977.32 km² or 76.27% of sea and a land area of 33,278 km² or 23.73%. It consists of 8 island cluster development regions with approximately 600 islands in all and more than 600 watersheds. The ecology of the narrow watershed areas is varied according to the bio-geophysical conditions and community socio-economic situation, the area of beach and the large sea area, which affects the hydrological process. The nearby ecosystems are linked and really affected by the availability of clean water and limited ground water; by volcanic action, earthquakes, landslides and tropical storms and it is also directly affected by the maritime climate. It has populations of endemic species which are isolated; most communities are poor and tied to traditions; the local economy is not improving resulting in migration of residents to towns causing a lack of good human resources in the villages [10]; [6]; [8]. Apart from all of the above, the Maluku archipelago is in the region known as Wallacea based on the results of a study of more than 100 Key Biodiversity Areas (KBA) which, overall, are ignored and at risk of extinction [3]; [9].

All of the characteristics mentioned are very susceptible to environmental damage, particularly from global warming and climate change, with impacts as described above. Such damage has already been occurring for several decades showing an increasing trend from year to year, with no restrictions. Based on the reality of the conditions and characteristics of these areas, a regional development concept has been created about the structure of the region of the province as well as the regencies and towns. However, it has not yet been integrated with the watersheds and sector development. Because of these issues, the agricultural concept for small islands was developed to be integrated with development structure of the province, regencies and towns and with the watersheds, which are the ecological units where the Hydro - Orology process can be measured. It also integrates sector development planning and the socio-economic conditions in the communities. In this way, all sector planning, especially for agriculture/horticulture, forestry, animal husbandry and marine culture is integrated into the regional development planning which is centred around the watershed. Until now, regional planning documents have only been administrative and guided by regulations so environmental damage and poverty continued with the resulting consequences as outlined previously.

The concept of a sustainable agriculture for small islands based on multi landscapes and a green economy is described in the conceptual framework of revising the conventional economic concept which seeks growth and is exploitative to a green economic strategy founded on creating a balance between ecological theory, economic and social needs to support sustainable development with indicators and aims to be achieved as follows: (1) reduction in emission gases; (2) increase carbon reserves; (3) attention to environmental variety; (4) economic growth. The important things are conservation of the natural ecosystem – sago, mangroves, wetlands, wildlife habitat, coastal plains, coral reefs; land and forest resources can support sustainability of production – staple foods, renewable energy, low carbon , reduction in greenhouse gases, ecosystem, wood and timber products; conservation of biodiversity – biology, species populations, carbon sinks; sustainable community-based economic

growth - social forestry, agroforestry, must be orientation to total economic value, environment; socio-cultural community rights – land rights, local knowledge, prosperous communities, community-based education, community colleges, social equality; disaster and climate change mitigation and adaptation processes; institutions – law makers, regional laws, autonomy, community organisations and strong regional government. All policies must be synchronized from the centre to the district and need to be totally reviewed. The conceptual framework complete with indicators must become the base to plan the macro and micro concepts for sustainability/conservation of the landscape and generational prosperity for communities.

3.2. Macro Concept for Development in Maluku

The macro concept integrates the multi landscape of small islands i.e. the island cluster, the island and its short, narrow watershed, as the management foundation. Integration results show twelve island clusters consisting of 1,340 islands with 1600 watersheds in Maluku. While in North Maluku there are 8 island clusters, 600 islands and more than 600 watersheds. All land use and systems, forest functions, socio-cultural information, tenancy and native title rights have already been integrated into the watershed of the islands and island clusters. For small islands there is one watershed per island.

The number of watersheds must be more than the number of islands, as has been determined. For Ambon, Seram, Buru and other islands there is more than one watershed per island. The characteristics and shape of each watershed need to be identified in respect of the bio-geophysical, social and economic properties - these are what differentiate small islands from continental regions. Thus the whole sectoral planning incorporates all planning and structures as well as the watersheds. Economic, ecological and social indicators of success (see [13]) need to be measured in the watershed units that exist in the island clusters. The macro concept is then divided into micro concepts of forest management units, other use land area units of agriculture, animal husbandry and marine culture as well as the entire ecosystem from the coast to the mountains in the form of social forestry and agroforestry.

3.3. Micro concept framework for landscape management

The micro concept details sustainable management of forests and other land use areas into management units based on the agroforestry landscape so each multi landscape unit achieves sustainability and community prosperity. These units are integrated with the watersheds and are aimed at achieving sustainability for the island clusters for the entire area of small islands in Maluku. The smallest management units consist of:

- 1) Production forest management unit
- 2) Protected forest management unit
- 3) Conservation forest management unit
- 4) Agroforestry management unit which includes: agrosilviculture, agrosilvopasture, permaculture, and agrosilvopasture fisheries (lakes, rivers and coast)

Analysis of an integrated multi landscape as described in the conceptual macro and micro framework has integrated with 5,418,500 hectares Forest Land-use (FLU) include Other Land-use (OLU), with 22 forest management units in 1600 watersheds, 1,340 islands in 12 island clusters in Maluku province. While in North Maluku, there are area 3,327,800 hectares FLU include OLU, with 16 forest management units in 600 watersheds, 600 islands and 8 island clusters. In addition, other land use areas (agricultural, animal husbandry, coastal and other), which have been developed along the agroforestry/social forestry system, form a management model for small islands in the green economy scheme which supports coastal and ocean conservation and helps to ensure generational community prosperity.

It needs to be stated that all development and scientific sectors which are concerned with land use have already been integrated and are not developed as separate sectors but in the social forestry and agroforestry management model. The development of the social forestry model in the management unit integrates community participation in the community forest, public forest and village forest, which do

not only produce timber but have non wood products also such as staple foods, renewable energy, ecotourism, forest services and others. While development of other land use areas which includes agriculture/horticulture, animal husbandry, fisheries, settlements, and infrastructure and so on can be developed using the agroforestry model.

The success of the implementation of the concept explained above is assured, if supported by good quality human resources i.e. professional staff, skilled, work ready with good soft skills. To achieve these ends community colleges or academic communities are needed - certificate and diploma programs to support sustainable management units as outlined in the micro concept. Basic education in agroforestry needs to be developed into education in agriculture, animal husbandry and fisheries to ensure the development of agriculture in small islands.

In relation to the environmental space, agroforestry plays a very important role in creating a strong structure around the native forest whereby the ecology, economy and social needs achieve a harmonious relationship within green economy principles. This means the development of agroforestry can restrain the rapid rate of deforestation and forest degradation, can rehabilitate and restore ruined areas, increase the conservation of diversity, increase carbon stock and produce multi-use products to improve community prosperity.

4. Conclusions

As an archipelagic nation, Indonesia has already experienced the threat of climate change and will suffer even more in the future if there is no rethinking about the concept and policy of green economic development. The process for driving policy change in small islands in the Maluku archipelago must be by adopting the multi landscape approach integrated with island clusters, the island oceans, islands, watersheds, management units and sectoral planning into a combined management unit to meet the goods and service needs of the community without any degradation of natural resources or the environment – in other words sustainable development.

Analysis of an integrated multi landscape as described in the conceptual macro and micro framework has integrated with FLU, with 22 Forest Management Unit (FMU) consist of 5 protected forest FMU (PrFMU) and 17 natural production forest FMU (PFMU) in 1,600 watersheds, 1,340 islands in 12 island clusters in Maluku province. While in North Maluku, there are FLU with 16 FMU consist of 5 PrFMU and 11 PFMU in more than 600 watersheds, 600 islands and 8 island clusters. OLU areas (agricultural, animal husbandry, coastal and other), which have been developed along the agroforestry/social forestry system, form a management model for small islands in the green economy scheme which supports coastal and ocean conservation and helps to ensure generational community prosperity.

Acknowledgements

Thank you to all who have helped in this research and the compilation of data and information used. Special thanks to Mrs Donna Harper, a native English speaker, for translating and correcting this work.

References

- [1] Anonymous 2015 *National Forest Reference Emission Level for Deforestation and Forest Degradation in the Context of Decision 1/CP.16 para 70 UNFCCC - Encourages Developing Country Parties to Contribute to Mitigation Actions in the Forest Sector* (Jakarta: DG Climate Change, Ministry of Environment and Forestry)
- [2] Anonymous 2016 *Perubahan Iklim, Perjanjian Paris, dan Nationally Determined Contribution* (Jakarta: DG Climate Change, Ministry of Environment and Forestry)
- [3] Burung Indonesia 2014 *Critical Ecosystem Fund, Ecosystem Profile Wallacea Biodiversity Hotspot for Submission to the CEPF Donor Council*
- [4] Di Gregorio M, Nurrochmat D R, Paavola J, Sari I M, Fatorellia L, Pramova E, Locatelli B, Brockhaus M and Kusumadewi SD 2016 Climate policy integration in the land use sector: Mitigation, adaptation and sustainable development linkages *J. Environmental Science & Policy* **67** pp 35-43

- [5] Harbi J, Erbaugh J T, Sidiq M, Haasler B and Nurrochmat DR 2018 Making a bridge between livelihoods and forest conservation: lessons from Non Timber Forest Products' utilization in South Sumatera, Indonesia *J. Forest Policy Econ* **94** (2018) pp 1-10
- [6] Kastanya A 2002 *Pengelolaan Hutan Produksi Lestari Berbasis Gugus Pulau di Maluku* (Yogyakarta: Universitas Gadjah Mada)
- [7] Kastanya A 2012 A Community and ecosystem-based sustainable forest management model for small islands in Maluku *J. Agricultural Science and Technology* **2** (4) p 418
- [8] Kastanya A 2014 *Rencana Pengelolaan Multi LanskapPulau-Pulau Kecil Berbasis Ekonomi Hijau (Green Economics) di Kepulauan Maluku. Pidato Pengukuhan Guru Besar Tetap Bidang Ilmu Perencanaan dan Ekonomi Sumber Daya Hutan Jurusan Kehutanan Fakultas Pertanian* (Ambon: Universitas Pattimura)
- [9] Indrawan M, Primack R B and Supriatna J 2007 *Biologi Konservasi* (Jakarta: Yayasan Obor Indonesia)
- [10] Monk K A, de Fretes Y and Lilley G R 1997 *The Ecology of Nusa Tenggara and Maluku. The Ecology Indonesia Series, Volume V* (Oxford: Oxford University Press)
- [11] Nurrochmat D R, Nugroho I A, Hardjanto, Purwadianto A, Maryudi A and Erbaugh J T 2017 Shifting contestation into cooperation: Strategy to incorporate different interest of actors in medicinal plants in Meru Betiri National Park, Indonesia *J. Forest Policy Econ* **83** pp 162–168
- [12] Sahide M A K, Nurrochmat D R, Giessen L 2015 The regime complex for tropical rainforest transformation: analysing the relevance of multiple global and regional land use regimes in Indonesia *J. Land Use Policy* **47** pp 408–425
- [13] Sukwika T, Darusman D, Kusmana C, Nurrochmat D R 2016 Evaluating the level of sustainability of privately managed forest in Bogor, Indonesia *J. Biodiversitas* **17** (1) pp 241-248