

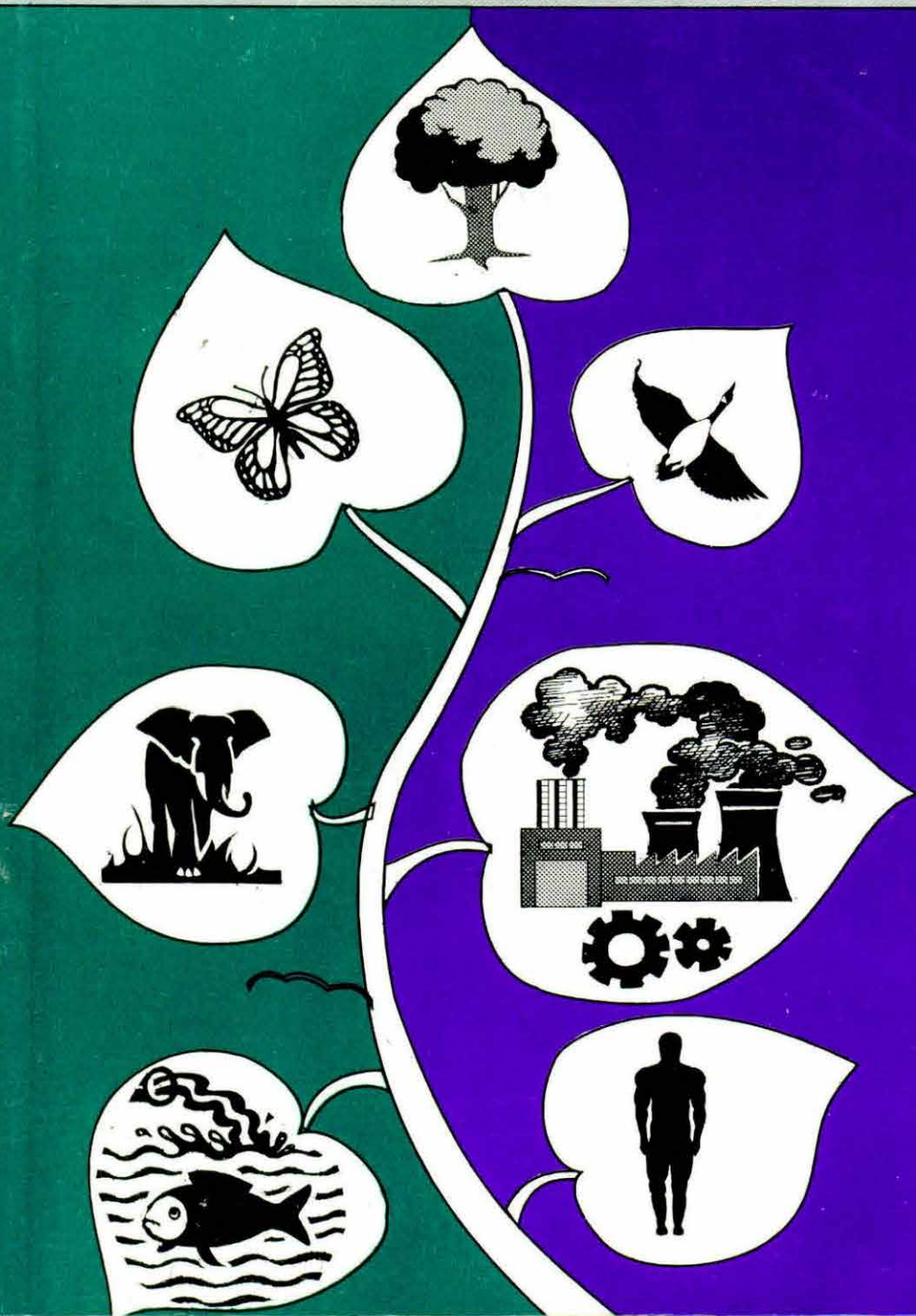
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ECOLOGY, ENVIRONMENT AND CONSERVATION

VOL. 23 (1) : 2017

CONTENTS

- 1–5 Spatial variability of Cd and Pb in Arable land of the Alborz dam downstream basin - Iran
—Ali Cherati Araei and Behmoush Jafari
- 6–11 Study of yield and Agronomic traits of forage crops in irrigation condition of Khorramabad region, Iran
—Behrouz Nasiri and Hadis Zaremanesh
- 12–17 Determination some physical properties of harmala (*Peganum harmala* L.) seeds
—Mojtaba Taheria, Amir Hossein Mirzabea, Neda Bahrami Bavanib and Mohammad Hossein Kianmehra
- 18–20 Effect of different levels of potassium fertilizer on the morphological characteristics of medicinal herb cumin
—Maryam Mosavi Nasab
- 21–24 Cross ability between commercial cultivars and interspecific hybrids (*Stoloniferum X tuberosum*) advanced clones of potato *Tuberosum*
—Bahram Dehdar, Jaber Panahandeh and Alireza Motalebi Azar
- 25–31 Investigation of effective factors on wheat crop insurance acceptance in Iran (Case study: Khorramabad - Lorestan province)
—Vahid Shokri, Mostafa Godarzi, Mohammad Reza Yousefi and Vahid alizadeh
- 32–36 An investigation on grain yield stability of wheat varieties at different planting dates
—Mohammad Sharifi- Alhosini
- 37–42 Designing of device for sediment grain size measuring
—Amir Hossein Tabee, Ali Karami - Khaniki, Ali Akbar Bidokhti and Kamran Lari
- 43–46 The effects of Putrescine and Salicylic acid on the quality and Longevity of cut flowers cloves (*Dianthus caryophyllus* L.)
—Mehrasa Anvari, Behrooz Salehi and Amrollah Nabigol
- 47–51 Evaluation of forage yield and land equivalent ratio in intercropping vetch *Vicia ervilia* with Autumn barley under dryland conditions of Ardabil
—Hossein Mostafaei
- 52–55 Evaluation the potential of climate cultivation in the provinces of Kermanshah, Hamedan by using Papadakis climatology
—Mehrdad Esfandiari, Davood Habibi, Ali Kashani, Darius Fath Allah Taleghani and Farzad Paknejad
- 56–62 Simulation and estimation of drainage water from underground drains, runoff and root water uptake in cultivating wheat on field-scale using the Hydrus-1D Model
—Arash Tafteh, Naser Davatgar and Niazali Ebrahimipak
- 63–70 Design of integrated infrastructure development in Poncokusumo Agropolitan Region- Malang, Indonesia
—A. Tutut Subadyo and Dina Poerwoningsih
- 71–76 Land use change and carbon stock dynamics in Tuban, East Java, Indonesia
—Rahmi Anna Fahria Gunawan, Amin Setyo Leksono and Aminudin Afandhi
- 77–83 Mangrove forest management on local communities-based in South Sulawesi, Indonesia
—Amal Arfan and Nur Ammy Suryaningsih Taufieq
- 84–89 Type of nickel laterization, lasolo fracture and mollase deposits of Southeast Sulawesi, Indonesia
—Adi Tonggiroh, Asri Jaya and Ulva Ria Irfan

- 90–97 Mapping potential of mangrove forests based on site demands (Geomorphological factors and physico-chemical characteristics of soil and water)
—*Kh. Mirakhorlou, S. Teimouri and M. Abadeh*
- 98–105 Enumeration of the flora of Wadi Lajab, Saudi Arabia
—*Yahya S. Masrahi, Remesh M. and Osama H. Sayed*
- 106–111 Sustainability of ecology and economics of urban farming development: case study in Makassar City, South Sulawesi Province, Indonesia
—*Abdullah, Gufran Darma Dirawan and Nurlita Pertiwi*
- 112–117 Study of the atmospheric parameters change due to the climate change on the Gaveroud River runoff using Simhyd models
—*Moslem Nazari and Ahmad Rajabi*
- 118–128 Prediction on the population and land need for housing using dynamic models
—*Ketut Mahendra Kuswara and Gufran Darma Dirawan*
- 129–134 Training environment design on the improvement of community knowledge around industrial area Tanjung Mallasoro at Jeneponto regency, Indonesia
—*Mudadtzir M., Muhammad Ardi, Faizal Amir and Gufran Darma Dirawan*
- 135–141 Implementing cleaner production in small and medium batik industry as efforts on environmental management and improving working productivity
—*Erina Rahmadyanti, Ketut Prasetyo and Dwiarko Nugrohoseno*
- 142–149 Influence of copper-based fungicides application on copper contamination of soils of cocoa farm at Akim Tafo, Eastern Region, Ghana
—*J.K. Kwodaga, G.T. Odamtten, E. Owusu and A.Y. Akrofi*
- 150–155 A study of phytochemical properties of various extracts of Ammi majus fruit using GC-MS technique
—*P. Sajadi Kaboodi, A.A. Moghadamnia, D. Bakhshi and A.A. Sefidgar*
- 156–160 Performance of various table and processing grape varieties under subtropical conditions
—*Gurlabh S. Brar, M.I.S. Gill, N.K. Arora and H.S. Dhaliwal*
- 161–166 Effect of different planting techniques and cutting practices on fodder growth, fodder yield and quality of dual purpose barley (*Hordeum vulgare* L.)
—*Manohar Lal and K.S. Saini*
- 167–170 An explorative study on the development of organic farming model
—*S.K. Das, S.K. Singh and M.A. Khan*
- 171–176 A review on contaminated soil remediation using Nanoscale zero-valent Iron (nZVI)
—*Nimita Francy and S. Shanthakumar*
- 177–182 Variety of applications of high performance liquid chromatography (HPLC) in plants
—*Chandra Kant Sharma, Snehal Kanole, Monika Sharma and Vinay Sharma*
- 183–189 GPS and GIS based soil fertility maps of Bhadrak District of Odisha, India
—*Antaryami Mishra, Dibyendu Das, Subhashis Saren and P. Dey*
- 190–196 Multivariate analysis of antioxidant enzymes and pigments in the leaves of plants in vicinity of river Beas, India
—*Vinod Kumar, Anket Sharma, Renu Bhardwaj and Ashwani Kumar Thukral*
- 197–200 Dietary pattern of stone-cutters: A study in Davanagere District of Karnataka State, India
—*Ravi, Y., M.L. Revanna, Vijayalakshmi, D. and Usha Ravindra*
- 201–206 Available soil macro and micro-nutrients under rice-wheat cropping system in District Tarn Taran of Punjab, India
—*Anil Kumar, Navjot Singh Brar, Shashi Pal and Prahlad Singh*

- 207–210 Studies on stomatal responses of Jamun (*Syzygium cuminii*) to exhaust pipe emissions from vehicles using different types of fuels
—Sukhvinder Kaur
- 211–216 Standardization of fermentation parameters for the production of food bio-colours through submerged bio-reactor fermentation
—S.R. Mhalaskar, S. S. Thorat and Y. R. Deshmukh
- 217–227 Application of remote sensing & Gis for demarcation of groundwater potential zones in a part of cauvery river basin, South India – A Case Study
—S. Hema and T. Subramani
- 228–247 Dispersal syndromes of alien invasive and alien non-invasive plants of the Kashmir Valley, India
—B.A. Khan, Manzoor A. Shah and Zafar A. Reshi
- 248–254 The use of natural pastures in the conditions of vertical zoning in the southeast of Kazakhstan
—Kazbek Shugaevich Smailov, Ilya Ilyich Alimayev, Kanysh Imanovich Kushenov and Zhanetta Batyrkhanovna Issayeva
- 255–260 Determination of reserves of phytomass and circannual deposition of fast-growing wood species in central Kazakhstan
—Dani Nurgissaevna Sarsekova, Indira Kuzdeubekovna Maissupova and Zhumagul Tanatkanuly Boranbay
- 261–266 Acetes meal as a non-conventional protein ingredient to partially replace fish meal in diets of pacific white shrimp (*Litopenaeus vannamei*, BOONE, 1931)
—P.J. Mahida, S.I. Yusufzai, S. R. Lende, A.H. Ishakani and R.M. Kadri
- 267–277 The influence of random technological and control impacts on the process of seed sowing and mineral fertilizers
—M. A. Aduov, S.N. Kapov, S.A. Nukusheva, E. Zh. Kaspakov, B.K. Tarabaev, K.G. Isenov and K. Volodya
- 278–281 A taxonomic note on *Cephalopsetta ventrocellatus* (Dutt and Rao, 1965) (family: Paralichthyidae, order: Pleuronectiformes) from north-west coast of India
—Shashi Bhushan, Vikas and A.K. Jaiswar
- 282–285 Development and nutrient analysis of cluster bean chocolate
—Charis K. Ripnar, Umadevi S. Hiremath and S. Anitha
- 286–291 Insect infestation and losses in stored food grains
—S.K. Vimala Bharathi, Vishnu Priya V., Vishnu Eswaran, J.A. Moses and Alice R.P. Sujeetha
- 292–295 Updating of sowing terms of spring wheat in the conditions of Northern Kazakhstan in conservation agriculture
—Almabek Batyrzhanovich Nugmanov, Yuriy Valerievich Tulayev, Saniya Abiltaevna Tulkubayeva, Svetlana Vladimirovna Somova and Evgeniy Mikhaylovich Vodopyanov
- 296–301 Spatiotemporal diversity, abundance and distribution of zoobenthos community of a temporary estuary in Kerala, India
—S.R. Regi
- 302–304 Population dynamics and regeneration of seedlings and saplings in *Anogeissus* forest of Bundelkhand region (U.P.) India
—Neel Ratan and U.N. Singh
- 305–310 Impact studies of different resource conservation practices on cropping systems in Kymore plateau and Satpura hill zones of Madhya Pradesh, India
—Ashish Tiwari, Anay Rawat, V.B. Upadhyay, K.K. Agrawal and S.K. Vishwakarma

- 311–315 Efficiency of earthworm to convert poultry wastes into vermicompost with different additives under change of seasons
—S.B. Agrawal, Sarita Singh, Ashish Tiwari, Anay K. Rawat and Ankit Sharma
- 316–321 Assessing the well yield during methane drainage in coal mines
—Artem Valerievich Leisle and Evgeni Rostislavovich Kovalski
- 322–329 Mutagenesis of *Pachysolen tannophilus* and its protoplast fusion with *Saccharomyces cerevisiae* for ethanol production
—Sushma Gurumayum, Krishan Lal Kalra and Gurvinder Singh Kocher
- 330–338 Dynamics of aquatic insects in the Mandakini river of Uttarakhand, India
—Gunjan Goswami and Deepak Singh
- 339–343 Effect of osmotic stress on plant growth promoting activities of the osmotolerant endophytic bacteria
—Bapi Das, Sangeeta Paul and Maheshwar Singh Rath
- 344–350 Development of linear models for predicting Ni concentrations uptake by three aquatic macrophytes species in vertical subsurface flow constructed wetlands
—Celestin Defo, Ravinder Kaur, Paritosh Kumar, Khajanchi Lal, Anshu Bharadwaj, S.D. Singh and Ranjit Kumar Paul
- 351–355 Assessment of occupational health and safety effectiveness at a mining company
—Andrei Nikulin and Anni Yulievna Nikulina
- 356–366 Genetic stability and adaptability for yield, horticultural and quality traits in chilli pepper across diverse environments in north western Himalayas
—Munish Sharma and Akhilesh Sharma
- 367–371 Changes in C: N ratio of different substrates during vermicomposting
—Jyoti Yadav, R.K. Gupta and Deepak Kumar
- 372–383 Standardization of an efficient and reproducible embryogenic cell suspension culture protocol for production of secondary metabolites in *Plumbago zeylanica* Linn
—S.L. Patidar, M.K. Tripathi, G. Tiwari, R.P. Patel and Ashok Ahuja
- 384–389 Control over the use of personal protective equipment by employees, head protection
—Andrei Nikulin and Anatoly Romanov
- 390–393 Design and technical specifications of small wooden purse seiners of Ratnagiri, Maharashtra (India)
—Siddhesh Desai, Makarand Sharangdhar and Ashish Mohite
- 394–396 Gall thrips infesting *Terminalia chebula* – one of the most important medicinal plants of Jammu and Kashmir, India
—Reena, Kaomud Tyagi, B.K. Sinha, P.K. Rai and S. Jamwal
- 397–400 Studies on pollen viability and floral biology in grapefruit (*Citrus paradisi* Mac Fadyen) cultivars under subtropical conditions of Punjab, India
—A.K. Baswal, H.S. Rattanpal, Gurupkar Singh Sidhu and Gurtej Singh Uppal
- 401–408 The research of the interinfluence of the environment conditions and people's economic behavior
—Irina Sergeevna Munkueva, Anna Semenovna Mikheeva, Victor Sergeevich Potaev, Iraidia Gomboevna Sangadieva and Georgiy Yur'evich Subanakov
- 409–415 Feeding of different level of digestible Carbohydrate to *Pangasianodon hypophthalmus* fingerlings: Effect on growth, amylase activity and gene expression
—Ravi Bhumarkar, Sujata Sahoo, Sarvendra Kumar, Md Aklakur and Narrotam Prasad Sahu

-
- 416–424 Evaluation of water production function and optimization of water for winter wheat (*Triticum aestivum* L.) under drip Irrigation
—*Sachin Himmatrao Malve, Praveen Rao and Anil Dhake*
- 425–431 The impact of the new fodder additive “M-feed” on the microorganisms of the rumen contents of calves and their growth energy
—*Djunaidi Shàramazanovich Gayirbegov, Vladimir Victorovich Mungin, Nadezda Ivanovna Gibalkina, Lyudmila Nicolaevna Loginova and Andrey Vladimirovich Valoshin*
- 432–439 Isolation of microbes for remediation of textile dye industry effluent
—*Shiny Guruce A., S. Rajanarayanan, K. Jegatheesan and B. Gopal Samy*
- 440–443 Cow urine distillate, an ethno medicinal tool to modern day therapeutics: A review
—*Sakshi Tiwari, Amit Shukla, Sakshi Chauhan, Vipul Thakur, Subhash Sharma and Seema Agarwal*
- 444–450 Improving methods for calculating air temperature in mine workings equipped with cold water pipelines
—*Vadim Rudolfovich Alabyev and Gennady Ivanovich Korshunov*
- 451–459 Quantitative morphometric analysis of Rangapur watershed using remote sensing and geographical information system (GIS) in middle Krishna basin of Raichur District, India
—*Mallika K.B., Maheshwara Babu, Rajesh N.L., B.S. Polisgowdar and G. V. Srinivasareddy*
- 460–463 Forms of apartment buildings taking into account sustainable architecture requirements
—*Olga Leonidovna Bancerova*
- 464–469 Development of vermicompost technology for organic tea cultivation at high altitude
—*J.S. Bisen, R.K. Chauhan, A.K. Singh, Mahipal Singh, B.C. Ghosh and B. Bera*
- 470–477 Damage assessment from the wave of break along the Bartogay Reservoir
—*Almas Bazarbayev, Margulya Bayekenova, Madina Nabiollina, Bauyrzhan Zulpykharov and Akhmetkerey Amanbayev*
- 478–487 Participatory technology assessment and refinement for evolving Climate-smart adaptations in the management of coconut based farming systems under coastal sandy soil conditions of South Kerala, India
—*S. Kalavathi, Jeena Mathew, Jacob Kurien, B. Anilkumar, C.K. Nampoothiri, K. Muralidharan and P. Subramanian*
- 488–493 Veterinary and sanitary assessment of pathology of slaughter products of cattle sick with ketosis on milk production farms
—*Ainur Jangabulova, Bozena Lozowicka, Piotr Kaczynsky, Amangeldy Maulanov, Akylbek Zhmageldiyev, Tolkin Abdigaliyeva and Gulnur Kuzembekova*
- 494–500 Studies on integrated production and pest management approaches in onion (*Allium cepa*, Lindeman)
—*R.K. Panse, S. K. Rajak, D. M. Kadam, Rishikesh Mandloi and Nand Ram Varma*
- 501–506 Leg autotomy: A novel mechanism in adults of *Plutella xylostella* (Linnaeus)
—*Anureet Kaur Chandi*
- 507–514 On application of thermal desorption mass spectrometry for detection of beryllium hydroxide
—*A.P. Koscheev, D.P. Gubanova, V.M. Minashkin, S.A. Bondarenko and L.O. Shoranova*
- 515–520 Dynamics of nutrient profile during vermicomposting
—*Jyoti Yadav and R.K. Gupta*
- 521–528 Studies on bio-efficacy and phytotoxicity of halosulfuron methyl 75% WG for weed management in sugarcane and their residual effect on succeeding crop
—*V. Pratap Singh, S.P. Singh, Abnish Kumar, Shalini, Neema Bisht, Kavita Satyawali and D.B. Singh*

- 529–533 The ecological, biological, and phytocenotic characteristics of *Artemisia kotuchovii* Kupr. in the republic of Kazakhstan
—Yury Andreevich Kotukhov, Alevtina Nikolaevna Danilova and Olga Alexandrovna Anufrieva
- 534–538 Indian agriculture: Present situation and their contribution in Economy
—S. K. Rajak, R. K. Panse, A.N. Goutam and D.M. Kadam
- 539–543 Comprehensive evaluation of anthropogenic load on environment components under conditions of ferroalloys manufacture
—Denis Petrov and Igor Movchan
- 544–553 Comparative analysis of physico-chemical parameters of water in main river channel of river Ganges after dam wall of Maneri Bhali Phase I and Phase II hydroelectric power projects
—Madhu Thapliyal, Poonam Tiwari, Bipinkumar Sati, Prashant Anthwal, Anjan Chakraborti and Ashish Thapliyal
- 554–561 Method to improve productive performance and digestion exchange of broiler chickens with reduced risk of aflatoxicosis
—Victor Khamitsevich Temiraev, Valery Ramazanovich Kairov, Rustem Borisovich Temiraev, Zalina Alimbekovna Kubatieva and Vladimir Mitsakhovich Gukezhev
- 562–566 Perspectives of use of lidar devices for forest inventory in Komi republic
—Dmitriy Olegovich Kvochkin and Vladimir Aleksandrovich Ustyugov
- 567–574 Salinity tolerance of *Pangasianodon hypophthalmus* in Inland saline water: effect on growth, survival and haematological parameters
—Ajay Kumar, V. Harikrishna, A.K. Reddy, N.K. Chadha and A. M. Babitha Rani
- 575–581 Examining electricity well irrigations nexus in South India: A multivariate cointegration approach
—R. Paramasivam, P. Paramasivam, M. Umanath, R. Balasubramanian and A. Surendran
- 582–586 Determination of the forest inventory indicators according to the photographs of the unmanned aerial vehicles
—Marsel Ravilyevich Vagizov, Vladimir Aleksandrovich Ustyugov and Dmitriy Olegovich Kvochkin
- 587–590 Genetic variability studies in wild pomegranate germplasm collected from four different districts of Himachal Pradesh, India
—Gopa Mishra, Girish Sharma and Sukumar Taria
- 591–597 New approaches to stable development of cities architecture by using bridge buildings and platform buildings
—Tat'yana Rustikovna Zabaluyeva
- 598–601 Identification of hexaploid synthetic wheat resistant to diseases
—Altynbek Kuresbek, Amangeldy Taskalievich Sarbaev, Kenzhali Rachimovich Chidirov, Vladimir Shamanin and Yerlan Bozanbaiulu Dutbayev
- 602–609 Effects of iodized yeast as feed supplement on growth and blood parameters in Lena sturgeon (*Acipenser baerii stenorrhynchus* Nicolsky) juveniles
—Yuliya Nikolaevna Zimens, Irina Vasilevna Poddubnaya, Alexey Alekseevich Vasiliev, Yuliya Anatolievna Guseva, Vladimir Valentinovich Kiyashko, Sergey Petrovich Voronin, Dmitriy Sergeevich Vironin and Anatoliy Petrovich Gumeniuk

Design of integrated infrastructure development in Poncokusumo Agropolitan Region-Malang, Indonesia

A. Tutut Subadyo and Dina Poerwoningsih

Department of Architecture, Engineering Faculty, University of Merdeka Malang, Indonesia

ABSTRACT

Integrated infrastructure development in the agropolitan region plays very important role in promoting economic growth of the region. Poncokusumo Agropolitan Region (PAR) Malang based on agro and eco-tourism is one of 11 (eleven) agropolitan in East Java Province of Indonesia. This study aimed to develop an integrated infrastructure development design direction to support the development of PAR. In this study the performance of PAR were analyzed by several methods: situational analysis, potential matrix, LAP (Land Allocations Percentages), Bayes-LQ (Location Questions), VA (Value Added), BCG (Boston Consulting Group), CF (Coumpounding Factor), and ISM (Interpretative Structural Model); independence level was analyzed with Multi Dimensional Scaling (MDS), and AHP (Analytical Hierarchy Process). The results showed that: (1) Development of PAR on post facilitation shows that positively impact performance; (2) Independence of the PAR on post facilitation still need to improve some aspects; and (3) development of infrastructure should be driving and leverage other sectors in the development of PAR independently which is reflected in the implementation of environmental management systems, sustainability of economic activities, social and cultural stability and preservation of the environment. The simulation results show the expected major infrastructure is roads, irrigation, drainage and building to support agribusiness. Infrastructure development optimistic scenario would be the best option because it provides a broad impact on the increasing of the total economic value of PAR. Model of Integrated Infrastructure (IT) development prioritized the infrastructure for agro-industries to encourage industrialization in PAR, both in household and industrial scale, which should meet the rules of norms, standards, guidelines and manuals in accordance with minimum service standards. IT development model in this PAR can be an agropolitan prototype development in Indonesia.

Key words : Agropolitan, Integrated infrastructure, Infrastructure development, Poncokusumo,

Introduction

National development in Indonesia preferred more to put economic growth in urban, so rural position is on conditions of stagnation, and continue to lag behind. Urban areas as engines of growth (city as an engine of development) trigger agglomeration development activities on a large scale, and increase heavy migration to urban areas (speed up processes), primarily to medium-sized cities (secondary city) (Sitorus, 2010). Strategy of rural areas develop-

ment by agropolitan concept is expected to balance the development of urban areas and rural areas. Agropolitan which focuses on the development of agribusiness and infrastructure towns of farmer (agropolitan) in rural areas of potential can only be done in a sustainable if the infrastructure available can stimulate and encourage the activity of production and markets in rural areas (Pradhan, 2003). Therefore, the availability of infrastructure (infrastructure) is critical to the development of the agropolitan (Heeres *et al.*, 2012).

The agropolitan concept seen most ideal to be developed in rural areas, particularly with the “research rural base” possession that turned out to be “robust” against the problems of economic crisis. It is because agricultural products produced by the Indonesian have a high value to market export abroad (Sitorus, 2010; Fatkhianti *et al.*, 2015). Poncokusumo Agropolitan Region (PAR) is one of the agropolitan developed in Indonesia, which has the leading commodity horticulture plateau (Farhanah and Prajanti, 2015).

Poncokusumo Agropolitan Region (PAR) Malang is one of 11 (eleven) agropolitan in East Java-based on horticulture and ecotourism. There were problems during the stages of the PAR development activities. Those problems were related to the development of human resources, capital, institutions, natural resources, artificial resources, layout, technology, and infrastructure. In the development of PAR, integrated infrastructure (IT) development is essential to support all the activities in it (Heeres *et al.*, 2012). PAR was developed through government facilities with aspects developed include natural resources, human resources, spatial, farming, housing, infrastructure, technology, capital, and institutional.

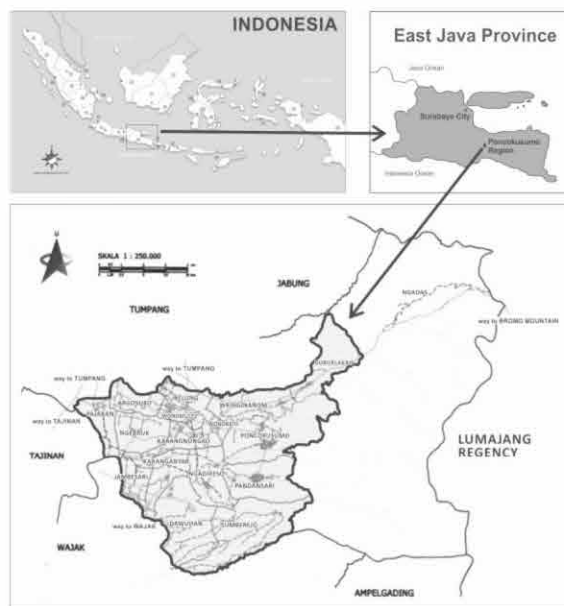


Fig. 1. Map of Poncokusumo Agropolitan Region

PAR performance is assumed to rise, after receiving support from the government stimulant and is projected to become independent. The availability of a sustainable integrated infrastructure is a prerequisite

site to supporting the development of independent agropolitan. Based on those background, we conducted the research regarding the performance of PAR post facilitation, PAR level of independence, and formulate an sustainable integrated infrastructure design.

As a system consisting of many components, the planning and design of PAR infrastructure should pay attention to the linkages and interdependencies between components, and their impacts. Planning and design of the infrastructure is a process with high complexity, multi-disciplinary, multi-sector and multi-user. So that the planning and design of infrastructure should not be sectoral, but also can not be too global. If the planning and design too specific (sectoral) regardless of other components, it will conflict with other components. Conversely, if too global, the result will not be effective (Grigg, 1988; Suripin, 2003; Conine *et al.*, 2004; Sitorus, 2010; Subadyo, 2012)

PAR is a system, which contains a plurality of high, multi-sector, multi finance, multi-disciplinary science. As a system agropolitan comprised of sub-system sub-system development, among others: (a) sub-system of human resource development, (b) sub-system of natural resources development, (c) sub-system of spatial development, (d) sub-system of se lement development, (e) sub-system of agribusiness development, (f) sub-system of infrastructure development, (g) sub-system of and information and technology development, (h) sub-system of capital development, and (i) sub-system of institutional development (Estrada-Carmona *et al.*, 2014; Rosdiana *et al.*, 2014; Kumar and Devadas, 2016).

This research aimed to develop models of integrated infrastructure (IT) development to support

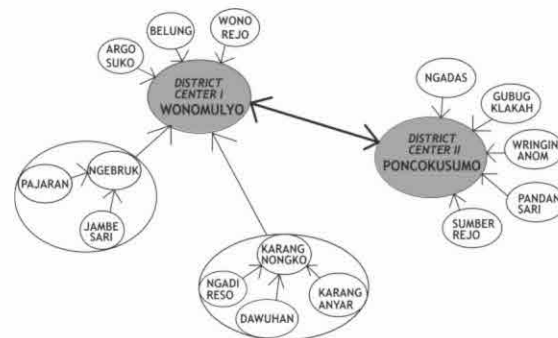


Fig. 2. Spatial Structure and Hierarchy of PAR Based on Agropolitan Districts

the agropolitan development in Poncokusumo Agropolitan Region. Thus the research questions to be answered are: (1) How is the performance of PAR; (2) How is the level of PAR independence after facilitated by the government; (3) How is the formulation on model design of sustainable integrated infrastructure development to support the PAR ?; and (4) How is the development policy direction of PAR?

Method

This research was conducted in Poncokusumo Agropolitan Region, Malang, East Java, Indonesia. The analysis performed include:

1. Analysis of the PAR performance: (a) to determine the general description of the study area, covering natural resources, human resources, housing, infrastructure, technology by was using situational analysis methods: (b) to determine the performance of PAR post facilitation by using matrix analysis methods of agriculture potential cumulative index (APCI) to determine the primary agricultural commodities featured in PAR, matrix analysis of public facilities cumulative index (PFCI) to determine agropolis in PAR, matrix analysis of demand agriculture potential cumulative index (DAPCI) to determine the final market towns (outlet) PAR, land allocations percentages (LAP) analysis to determine the land use paern, Bayes analysis, LQ, R/C ratio, added value, BCG (Boston Consulting Group) analysis for farming, processing and marketing, analysis of compounding factors for capital and analysis of interpretative structural modeling (ISM) for the institution.
2. Analysis of PAR independence level: to determine the value of the independence agropolitan index level based on the dimensions of farming, agro-industry. Marketing, individual infrastructure and superstructure was by using analysis method of multi-dimensional scaling (MDS), a modification of Rapfish called Rap-Agro
3. Designing a model of an integrated infrastructure (IT) development in PAR: to determine the linkages between sub-sub models of infrastructure development and major infrastructure required by PAR as well as to predict what might happen in the future in accordance to the achieved objectives that are prepared in the pessimistic moderate and optimistic scenario. The analytical method used: dynamic systems analysis, design criteria analysis and financial

analysis

4. Formulation of an integrated infrastructure (IT) development policy direction: to determine the priority of policy alternatives in PAR infrastructure development was by using AHP (Analytical Hierarchy Process)

Results and Discussion

Performance and Level of Poncokusumo Agropolitan Region Independence

The results showed that PAR performance on post government facilitation (2013) has increased significantly. This increase is characterized by indicators of success: increasing the level of education, public awareness about the preservation of natural resources and the environment, the application of agricultural technology, the feasibility of the selements, improving the quality and quantity of infrastructure, as well as the institutional role. The increase in revenue earned through the expertise in selecting the type of commodities that were financially viable and the added value were gained



Fig. 3. Fruit Plantation and Apple Production in Poncokusumo

through the final processing and marketing system to bring the production to the final consumer.

PAR independence degree from the analysis on the dimensions of farming, agro-industry, marketing, infrastructure and superstructure showed that the index value is good enough (60.11) which means that PAR is in the category "agropolitan" though not independent. To enhance the PAR independence, the most important dimension is the agro-industry, and then followed by improved marketing dimensions and superstructure dimension.

Agro-industry developed creatively and cleaner production is an innovation in the region toward an independent agropolitan. Porter *et al.*, (1999) and Sitorus (2010) argues that welfare must begin with improvements in productivity and increasing value added through quality and competitiveness processing. The higher the productivity, the better the competitiveness of the business, and the more creative in the production processing, the higher added value to be obtained. The added value will also be higher if there is net production of hazardous materials, pollutants, or contaminants that is wasted through sewerage or released into the environment before being recycled, treated or disposed of. Clean production does not involve the production process but also involves the management of the entire production cycle, starting from raw material procurement, processes and operations, and waste production, to distribution and consumption. Innovation through the development of creative industries and clean production is an important node that can improve productivity, simplify process steps as well as improve the appearance and taste, will ultimately improve the economic value in PAR towards independence.

PAR independence will be more quickly achieved if development is carried out in partnership between the relevant stakeholders. It will be able to create profits together with the principle of mutual need, raising, developing as well as an equal partnership between stakeholders. The partnership principle can generally be identified consists of three basic principles that can be used as a strong starting point for all stakeholders to work together, namely equality, transparency, beneficial and mutual for all stakeholders (Hafsah, 1999; Subadyo, 2012; Kumar & Devadas, 2016).

The results of the simulation model of the integrated infrastructure development in PAR shows that the main infrastructure for the agropolitan base

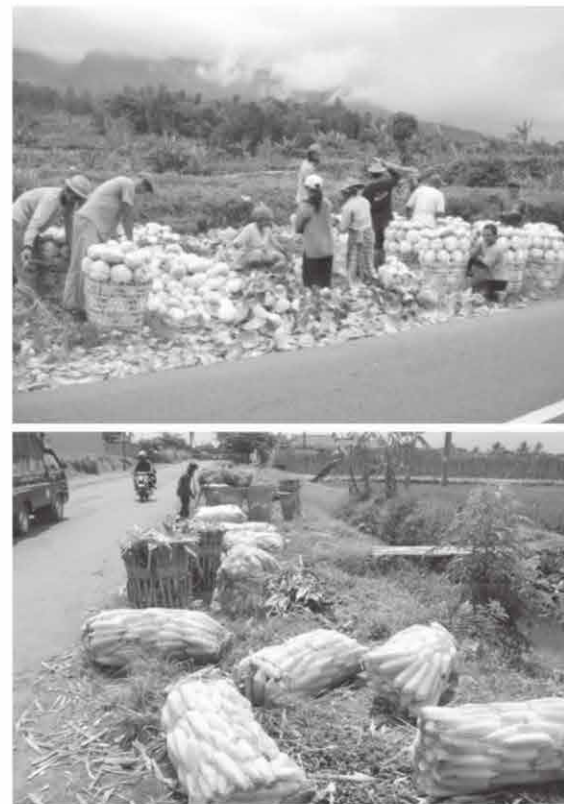


Fig. 4. Post-Harvest Conditions in the Absence of Temporary Shelter Production (TSP)

on commodities horticulture, among others, are: road (farm roads, village access roads, and the roads between villages and towns), water infrastructure (water irrigation and water supply), drainage network and building support (sub terminal agribusiness, packing house and cold storage) (Heeres *et al.*, 2012). The road network, especially axis road and farm roads, support the improvement of farming by increasing the number of production facilities capable of being transported to the land, and crops are being transported to the collectors and market. Irrigation facilities can improve farming through the addition of raw water availability for agriculture so that the planting frequency can be increased in the dry season.

Development scenario of integrated infrastructure (IT) in PAR that have been chosen through alternative optimistic scenario is to improve the condition better for all the variables, through the development of infrastructure to support farming, marketing and post harvest processing. Through the optimistic scenario, it is expected to have a wide impact on the improvement of the economic value

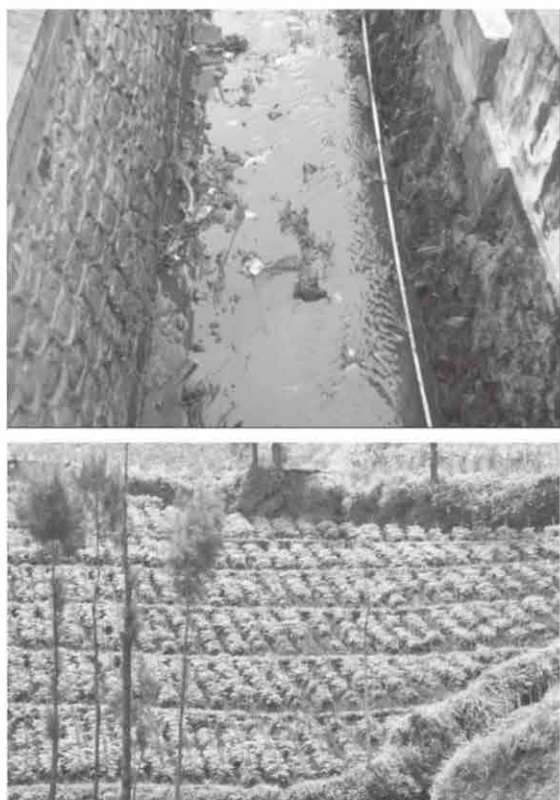


Fig. 5. The Availability of Irrigation Channels that Support the Agricultural System in PAR

of the total area and decrease the unemployment rate, which will be implemented gradually over the long term. Through the optimistic scenario, the value of an integrated infrastructure development interventions in the early years of the simulation (2014) and the end of the simulation (2039) are predicted to increase the economic value of the total area amounting to Rp.75 billion in the beginning of the simulation (2014) and Rp.125 billion in the end of the simulation (2039).

Policy priority of integrated infrastructure development in PAR is the infrastructure development to support agro-industry in order to encourage industrialization in the agropolitan both in the household scale and large-scale industry through the development of facilities home industry, industrial processing factory facilities, cold storage, packing house, and village access roads. The next policy is to expedite the marketing of agricultural products to the market towns final (outlet) through the development of agribusiness terminal (AT) and the roads between villages and towns. Specific policy of infrastructure development in PAR should meet NSGM

rules (norms, standards, guidelines, manuals) and meet the MSS (minimum service standards).

Simulation model of infrastructure development in PAR was built through the logic of the relationship and interaction between submodel related, includes sub-models: population growth, land use, production/processing/ marketing of agriculture, infrastructure to support farming, infrastructure for processing, and infrastructure to support marketing, the economic value of regional products and employment. Sub-model simulation results illustrate that the population likely to be positive population growth (positive growth) rose following an exponential curve until the year 2039. This is due to the pace of birth rate greater than the rate of mortality. While the land use sub-model simulation results indicate the change of land use horticultural land into land selements are expected to average area of 4.3 ha/year.

The simulation sub-model results of farming, processing, and marketing, showed a tendency to decrease the production rate, as a result of a decrease in horticultural land area, whereas the one hand the increase in population occurred significantly. Conditions such as these will be very pos-

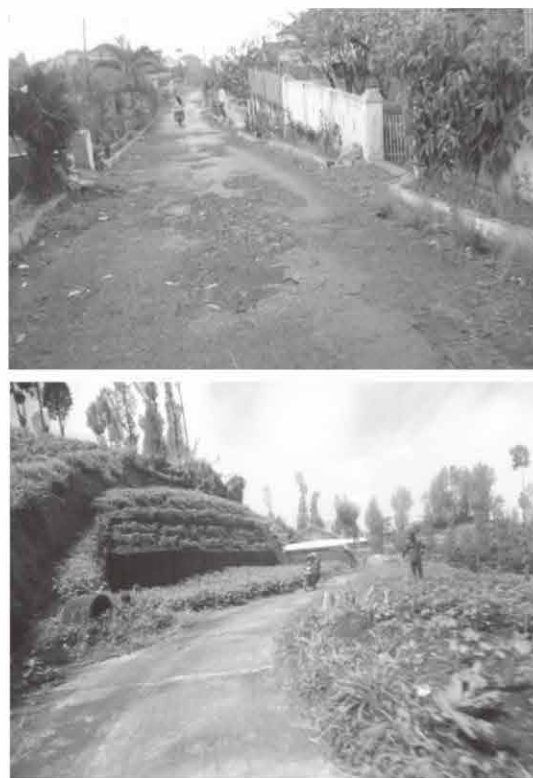


Fig. 6. Road Infrastructure Condition that Support PAR

sible shortages of horticulture if it is not maintained the balance between supply and demand. Sub-model simulation infrastructure for farming, processing, and marketing shows that the availability of irrigation and farm roads will support the increase of the farm production rate. Availability of agro sub-terminal and village roads access will expedite agricultural products marketing as they will be able to bring products closer to market, while the availability of traditional markets and roads between villages and cities will be able to bring the production to the final consumer.

Furthermore, the sub-economic simulation model showed a significant prediction that until the year 2039 the economic of PAR are affected by proceeds from the sale of horticultural production in fresh form plus the proceeds from the sale of the processing and marketing that are directly sold to wholesalers/distributors in the sub-terminal agribusiness which is already in region. The whole process bring added value that are economically profitable. Meanwhile for the results of the labor simulation sub-model obtained significant results that employment is high enough. This is because of the multiplier effect influence on agribusiness that developed include horticultural production, post harvest processing in the domestic scale, as well as the transactions that occur directly between farmers and traders in sub-terminal agribusiness.

Infrastructure Development Scenario of Agropolitan

Integrated infrastructure (IT) development scenario on PAR can be done through the intervention of the variable infrastructure for farming, processing, and marketing in which its regional development progress indicators are region's economic value and the number of unemployed.

Selection of sustainable integrated infrastructure development in PAR is done with the optimistic scenario approach, by intervention in the construction of roads, irrigation, AST (Agro Sub Terminal), household and industrial facilities processing minced chili powder. This optimistic scenario through sustainable integrated infrastructure development in PAR can increase the total economic value of the region significantly until the year 2039, and to reduce the unemployment rate to the level of 10.04% in 2039.

Infrastructure Development Model

Based on the analysis of Analytical Hierarchy Pro-

cess (AHP), it can be formulated development strategies integrated infrastructure in agropolitan PAR, which factors are most important to the least important are (1) land suitability (0.412), (2) region accessibility (0.236), (3) human resources (0.174), (4) technology and energy (0.119), and (5) financing (0.059).

Land suitability factors play an important role in the development of integrated infrastructure in PAR, as it will determine the effectiveness and efficiency of infrastructure development. The effectiveness and efficiency of land is determined by the role of stakeholder Stakeholders or actors are most important to the least important, namely (1) the government (0.401), (2) the farmer (0.259), (3) entrepreneurs (0.199), (3) co (0.110), and (5) banking (0.031). The government's role is highly expected as a motivator and facilitator in the development of infrastructure PAR, especially Malang Regency Government that should act as a major stakeholder.

The result of this study showed the order of strategic priority in PAR development as follows: (1) the increasing of income (0.324), (2) the expansion of employment (0.298), (3) the expansion of the market (0.237), (4) the increasing of competitiveness (0.091), and (5) regional development (0.051). Interest of income increasing is prioritized by considering that the income of farmers has always been very inadequate and often lose money, whereas the core activity of agribusiness development in PAR is farming as a major community activities

The result of this study also showed the order of priority in the decision-making process of integrated infrastructure development that is sustainable in PAR as follows: (1) the construction of supporting infrastructure agoindustri amounted to 0.333, (2) development of infrastructure to support marketing (0.285), (3) development of infrastructure supporting farming (0.246), and (4) development of supporting infrastructure for se lement (0.134). Development of agro-industries supporting infrastructure is needed because it could lead to a multiplier effect on PAR mainly in improving the region's Gross Domestic Product.

Conclusion

The conclusion that can be drawn from the results of this study are as follows: Infrastructure development in PAR into propulsion, thrusters, and levers, other sectors, which significantly impacted performance improvement PAR, such as:

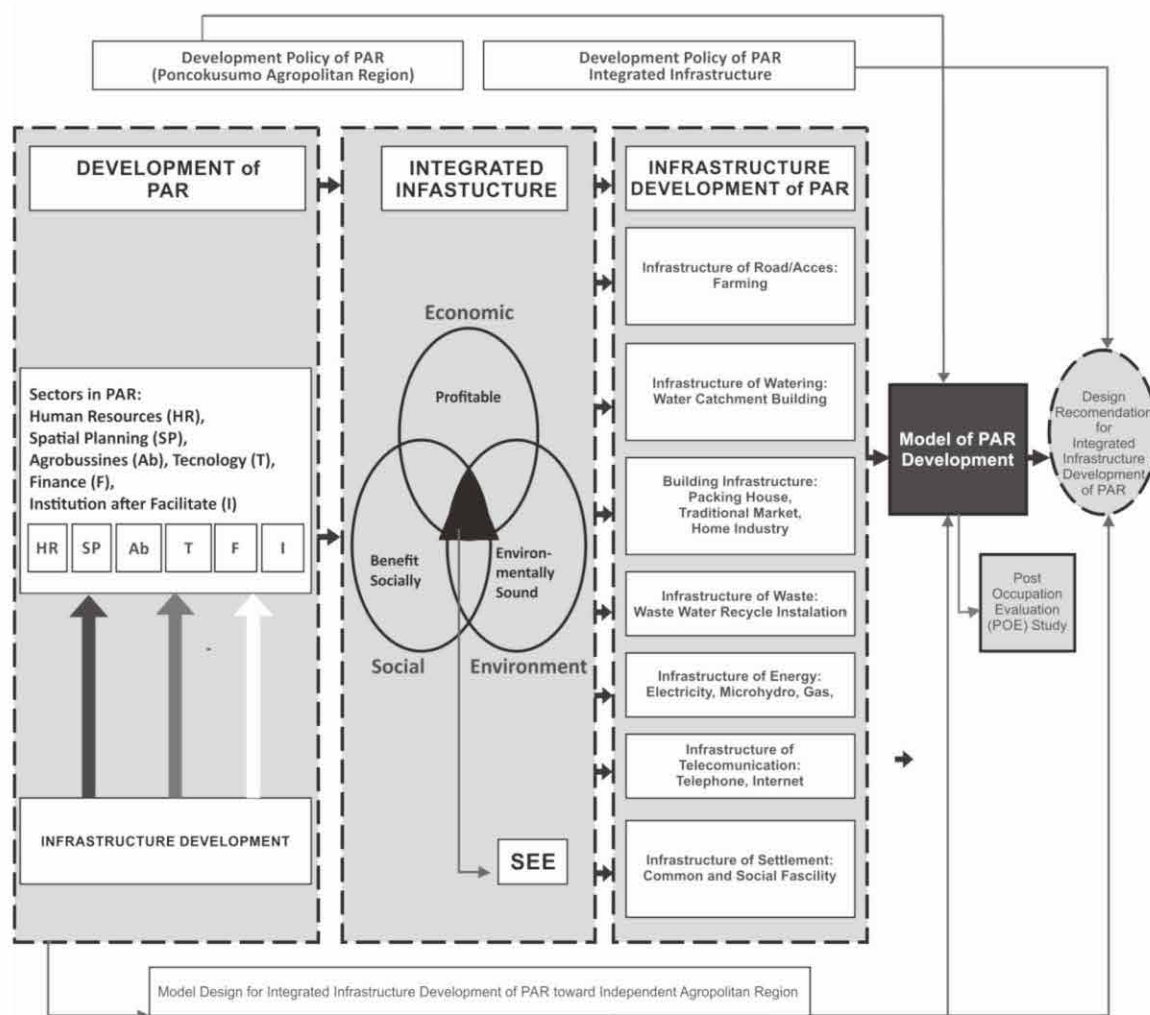


Fig. 7. The Conceptual Model of Integrated Infrastructure Development in Poncokusumo Agropolitan Region

1. Paerns of thorough development of the production centers area to the processing centers on the agropolis), will encourage the spread of population evenly.
2. The development of agricultural technology in PAR especially for manufacturing industries based on agricultural commodities in the household (home industry), will encourage the management of the original PAR conventional to semi modern.
3. The paern of residential development which still retains the traditional paern of beautiful and rural in character, with a building density is low, will be a regional power that is important to be maintained.
4. The existence of the Poncokusumo village and the Wonomulyo village which will be the new

farm town/Agropolis can serve as agropolitan development centers, distribution and services centers, trade and service centers of agro-industry, housing and selement development centers, public facilities as well as service centers and social facilities.

Related to the above conclusions, the formulation of the design concept of infrastructure development in PAR should be based on:

1. The environmental management system (EMS), that takes into account to aspects of environmental sustainability (ecology), the economic activity sustainability and social culture stability.
2. Infrastructure development scenario in PAR is directed to the optimistic scenario, with interventions through improve the conditions of all

variables in the infrastructure construction to support farming, marketing and processing.

3. The concept of infrastructure development policy in PAR, directed (a) to push the speed and independence PAR, (b) to encourage local economic growth in PAR through the development of the system and based agribusiness commodity that competitive, (c) to encourage the formation of farmers' towns/agropolis in Poncokusumo and Wonomulyo which serves as a service center and distribution of goods and services center in PAR and (d) to prioritize the development of supporting agroindustry infrastructure, followed by marketing infrastructure, farming and selement.

In line with the infrastructure development policy above, this paper proposes the following facilities:

1. Infrastructure facilities for supporting agroindustrial that are most needed are the packing house, the unloading field, cold storage, clean water supply, sewage and waste water facilities, telecommunications networks, and the manager secretariat office.
2. Infrastructure facilities for supporting marketing that are most needed are a wholesale market/agribusiness terminal (AT) and the traditional markets in the cities of the marketing end (outlet).
3. Infrastructure facility for supporting farming that is most needed is a secondary farm roads that can be passed four-wheeled pickup vehicles.
4. Infrastructure facilities for supporting selements that are most needed are public facilities and social amenities in PAR that is equivalent with the urban, so it can withstand the pace of migration to the cities.

Design of infrastructure development in PAR is directed to encourage the development of systems and agribusiness completely and thoroughly from upstream to downstream. The integrated infrastructure development that is designed in PAR is also encouraged to play a role as a leverage and the prime mover to the other relevant sectors in the agropolitan.

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