STAKEHOLDER ANALYSIS ON THE ASSESSMENT OF ECOSYSTEM SERVICES FOR RECREATIONAL FOREST PLANNING: A CASE STUDY OF PANTI RECREATIONAL FOREST, KOTA TINGGI, JOHOR

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Abstract *The planning and management of recreational forests in Malaysia are currently focused on providing recreational benefits for the local community while preserving the natural environment to improve people's quality of life. Incorporating stakeholders' involvement in the decision-making process will help planners and forest managers in planning strategies for a sustainable environment in the area. This paper analyzed the stakeholders' value towards four groups of ecosystem services namely provisioning services, regulating services, cultural services and supporting services in Panti Recreational Forest, Kota Tinggi, Johor. A total of 60 respondents representing different stakeholder groups were identified and Toolkit for Ecosystem Services Based Assessment (TESSA) was applied to assess the most important ecosystem services served by the forest and major threats to ecosystem services identified according to the mean impact score was calculated. Results from the study showed that there are ecosystem services most valued by respondents which are recreation and tourism and water-related services. However, major threats such as water management issues such as water-based tourism activities are identified as possible threats to the sustainability of the forest that could be taken into consideration for planning and managing the recreational forest. The study highlights the importance of incorporating stakeholders' preferences in defining ecosystem services for recreational forest planning which could contribute to the implementation of forest management guidelines.*

Keywords: *Ecosystem Services, Panti Recreational Forest, Recreational Forest, Stakeholder Analysis, , Toolkit For Ecosystem Services Based Assessment (TESSA)*

INTRODUCTION

Recreational forest ecosystems provide a wide range of direct and non-direct benefits to visitors and the local community. Nowadays, rapid urbanization leads to the increasing demand for outdoor recreation and the recreational forest is seen as a suitable spot to run

away from stresses and indulge in the tranquil and scenic spots offered by the forest. The development of recreational forests may boost the local economy sector but at the same time, might disrupt the daily life of the local community.

Since 1950, human activities such as agriculture, forestry, industries, fisheries, and urban settlement are the direct causes of the decrease of 60% of all ES (MEA, 2005). However, forest ecosystems provide critical ES for humanity by providing the supply of global biodiversity (Guillermo et al., 2018). Benefits from ecosystem services are readily available throughout the history of human beings, but it is taken for granted by societies by degrading the support system for ecosystem goods (Levin et al., 2008; Seppelt, et al., 2011; Guillermo, et al., 2018). Guerry et al. (2015) stated that the main challenge in ecosystem services management is to develop an economic and social system that positively supports sustainable human consumption while maintaining the supply of ecosystem services for human well-being.

Ecosystem services (ES) can be defined as benefits obtained from the ecological system by human beings (Levin, et al., 2008). Baral et al. (2017) suggested sociocultural, economic, and ecological values to assess the mountain forest ecosystem. A few tools were identified to analyze each of the values such as focus group discussion, mapping tools, structured questionnaire and Q methodology for sociocultural value, TESSA Toolkit, artificial intelligence, and trade-off tools for assessing ecological value and economic value can be assessed with benefits transfer method and stated-preference technique. The diverse value towards ecosystem services among different stakeholder groups should be assessed, identified, and prioritized for the planning and managing forest ecosystem. Paletto et al. (2014) stated that by involving stakeholders' values and attitudes in planning and managing forests is a critical step to reducing any conflicts and leads to the success of forest planning implementation.

Hussein (2014) assessed the stakeholders' involvement in managed recreational forests in Selangor, Malaysia and revealed that landscape management in recreational forests is not in line with the landscape sustainability approaches. Paletto et al., (2016) investigated the differences of power between stakeholders and found out that public administration is the most influential in all forest management issues. This should not have happened as the main purpose of developing recreational forests is to provide opportunities for outdoor recreation among visitors and preserve the flora and fauna of the area. Not only should the public administration be involved in the planning process but the diverse opinion of visitors, heads of the community, private agencies or operators or tour operators as well as the local people should be valued before implementing any management guidelines for recreational forests. Therefore, this study aimed to assess stakeholder perspectives towards forest ecosystem services for the formulation of recreational forest planning particularly for Panti Recreational Forest, Kota Tinggi, Johor. Allah Taala says:

﴿ وَهُوَ ٱلَّذِىٓ أَنزَلَ مِنَ ٱلسَّمَآءِ مَآءً فَأَخْرَجْنَا بِهِۦ نَبَاتَ كُلِّ شَىْءٍۢ فَأَخْرَجْنَا مِنْهُ خَضِرًا نُّخْرِجُ مِنْهُ حَبًّا مُّتَرَاكِبًا وَمِنَ ٱلنَّخْلِ مِن طَلْعِهَا قِنْوَانٌۭ دَانِيَةٌۭ وَجَنَّٰتٍۢ مِّنْ أَعْنَابٍۢ وَٱلزَّيْتُونَ وَٱلرُّمَّانَ مُشْتَبِهًا وَغَيْرَ مُتَشَٰبِهٍۗ ٱنظُرُوٓا۟ إِلَىٰ ثَمَرِهِۦٓ إِذَآ أَثْمَرَ وَيَنْعِهِۦٓ ۚ إِنَّ فِى ذَٰلِكُمْ لَءَايَٰتٍۢ لِّقَوْمٍۢ يُؤْمِنُونَ ﴾

Which means, "*And it is He who sends down rain from the sky, and We produce thereby the growth of all things. We produce from its greenery from which We produce grains arranged in layers. And from the palm trees – of its emerging fruit are clusters hanging low. And [We produce] gardens of grapevines and olives and pomegranates, similar yet varied. Look at [each of] its fruit when it yields and [at] its ripening. Indeed, in that are signs for a people who believe.*" (Al-Quran. Al-An'Am: 99).

Anas ibn Malik r.a. narrated:

Which means, *"There is none amongst the Muslims who plants a tree or sows seeds, and then a bird, or a person or an animal eats from it, but is regarded as a charitable gift".* (Hadis. Al-Bukhariyy).

LITERATURE REVIEW

Forest Ecosystem Services
The Economics of Ecosystem and Biodiversity (TEEB) identified four common ecosystem services which are provisioning services (raw food, water, timber), regulation services (climate regulation, carbon sequestration, air quality control), cultural services (cultural landscape, cultural tourism) and supporting services (natural diversity, soil formation, photosynthesis). In the context of forest ES, Guillermo et al. (2018) identified examples of ES that should be taken into consideration in managing forest ecosystems including providing ecosystem goods such as fruits, fuelwood, fiber and industrial products. Forest ES helps in maintaining the climate temperature, lessening greenhouse gases as well as reducing the impacts of natural disasters (Pan et al., 2011).

Forests play a crucial role in both the formation and retention of soils thus preventing soil erosion (Guillermo et al., 2018). On the other hand, vegetables, legumes, and fruits that are pollinated by insects and their pollinators – the majority of which only exist in forested areas – make up around one-third of the human diet (Martin et al., 2015). Human deeply value natural ecosystems, particularly forests, as indicated by their growing interest in outdoor activities such as bird watching, hiking, camping and nature photography (Guillermo et al., 2018). Human start to discover an unrivalled source of wonder and inspiration, tranquility and beauty, fulfillment, and refreshment in forest settings (Martinez et al., 2016). There is widespread agreement that forests are the primary providers of ecosystem services that consider up to 100 different forest services such as the production of food, fiber and fuel, the conservation and regulation of water, climate change regulation, biodiversity preservation, ecotourism opportunities and aesthetical value (Martin-Lopez et al., 2016).

Stakeholder Analysis In Ecosystem Services Assessment
MEA (2005) issued concerns in synthesizing the understanding of ecosystem sustainability in policy making relevance and the needs to analyzing the strengths and gaps in the underlying of ecosystem services scientific research. Rapid population growth among humanity leads to the weak relationship to the natural ecosystem thus requires detailed efforts and focus in maintaining the sustainability of the ecosystem (Guillermo et al., 20180). Peh at al. (2013) stated that methods for quantifying services must be practical and affordable either in terms of equipment, time or expertise to be able to produce data that is pertinent to decisions affecting the site and communicating the results to stakeholders' group such as policymakers, planners and managers for them to use it at the site scale level. However, to achieve the sustainability in ecosystem services management, it is very important to maintain the conservation of ecosystem services and biodiversity to be integrated in the landscape level (Gustafsson et al., 2012).

Guillermo et al. (2018) highlighted the importance of management strategies for forest planning that encompass broader protection and maintenance of biodiversity and ecosystem services. It is likely that these innovative tactics will result in lower commodity input while increasing ecosystem services provision for the whole society. Studies on the concept of ecosystem services will bring significance change of stakeholders' perspective who are directly or indirectly affected by decision making process on the land resource management. It is very important to understand the perspectives towards ecosystem services to design landscape the constantly promoting the human well-being while protecting the biodiversity (Guillermo et al., 2018).

The main purpose of ecosystem services assessment is to provide the detailed information and related knowledge that could be utilized by stakeholders' group for

informing policy decisions, developing planning strategies and creating the development plan (Nieto-Romero et al., 2014). Regions that are extremely dependent on the flow of ecosystem services and its implication to human well-beings should be aware of patterns in ecosystem services fields including the impacts of governmental actions and ecological constraints (Jose et al., 2018). Therefore, early engagement of stakeholders' group is a crucial step to ensure the successful of the assessment because it can help in understanding the site's economic, ecological, social, and cultural importance. In fact, tensions between groups are frequently reduced whenever stakeholders' group are given opportunities in finding and evaluating the knowledge and communicating the results (Peh et al., 2013). It is widely known that effective forest management contribute to the physical and mental health of human but will be able to produce synergies in agricultural industry in terms of food production and regulating services (Abson et al., 2014).

METHODOLOGY
This study employed Toolkit for Ecosystem Services Based Assessment (TESSA) comprises with the rapid appraisal analysis, identification of the alternative sites, primary and secondary data collection and analysis. The rapid appraisal was conducted in August 2022 followed by the identification of the stakeholders' group to be consulted, the types of ecosystem services to be identified, the level of possible threats and the plausible alternative sites.

Case Study
Panti Forest Reserve is a Permanent Forest Reserve in the Kota Tinggi district, Johor. This area is a major appeal habitat for large mammals and a stopover destination for migratory birds in addition to flora and fauna species. The main mission of the Johor State Forestry Department is to make the Panti Forest Reserve a Panti Conservation Area (PCA) which is a fully Protected Forest. The Panti Forest Reserve was gazetted on 15 September 1949 as a Permanent Forest Reserve under the National Forestry (Usage) Enactment 1985 of the State of Johor with an area of 13,152.13 hectares.

Toolkit for Ecosystem Services Based Assessment (TESSA)
TESSA is a toolkit designed for non-experts in helping users to identify which ecosystem services they need to assess, what data that are required to measure the service, which methods to be applied in the different context and how the results of the study could be presented and implemented in decision making process. Decision trees are developed in the toolkit to assists the users to the specific methods that is suitable to conduct and guide users in the data collection and analysis process (Peh et al., 2013). Figure 1 below illustrates the process of stakeholders' engagement in the toolkit.
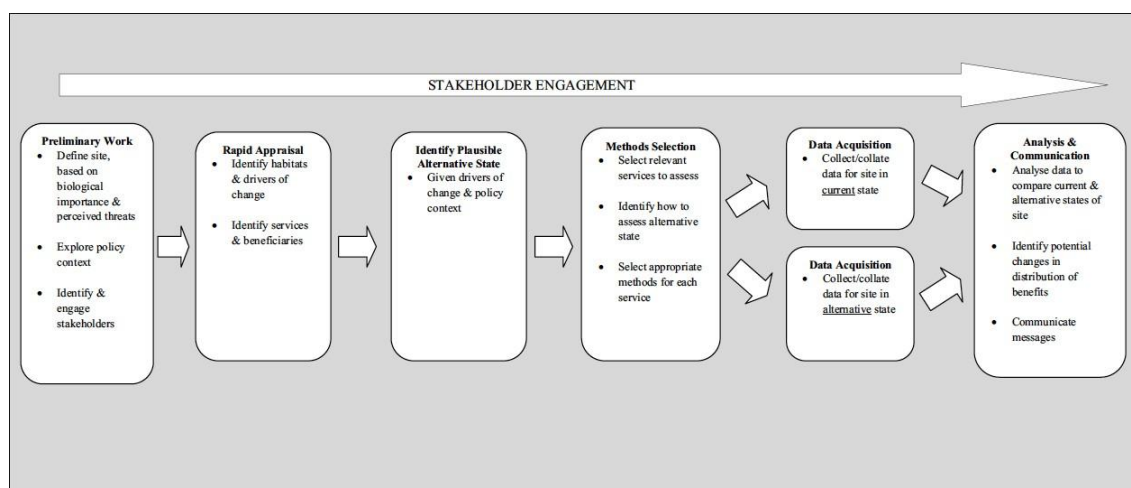
Figure 1: Stakeholder engagement process in TESSA Toolkit
Source: Peh et al. (2013)

As the toolkit was designed exclusively as a framework to assess ecosystem services with a direction to the importance of the site preservation based upon the values of biodiversity, this guideline is applicable to the non-experts technical by allowing people to identify ecosystem services provided at the site and encourage stakeholders' participation. This study started with the preliminary works by defining the site's characteristics particularly its biological importance and possible threats. Additionally, secondary data collection was conducted to analyze the related local policy and governance context about the site for the broader context in understanding the site while helping in the identification of stakeholders' groups that should be involved in the study.

Next, rapid appraisal analysis was conducted for primary data collection through structured questionnaire and respondents were identified from three stakeholders' groups: local authority, local community, indigenous people. Rapid appraisal process helps in identifying the most important habitats to provide the data on the services offered by the site, land-use change patterns and its drivers. Structured questionnaire used in this study started with Section A to identify demographic profile of respondents, followed by Section B to analyze possible threats or activities that might affect the sustainability of the area according to the timing, scope that represent percentage of site affected and degree of impacts of the change in the next years. Next, respondents were asked types of ecosystem services offered by the site in Section C and Section D asked respondents to write their opinion on the changes of ecosystem services that might be likely to happen in the next 10 years.

Data collected on the drivers of land-use change then were utilized to identify the most plausible alternative state guiding by the local context analysis. The plausible alternative state shows the condition of the site that is likely to happen in the future (typically in the next 10 – 20 years) based upon the consideration on the past decisions, the current available data and information and consistency of the key possible threats and land-use change patterns as suggested by Peh et al. (2013).

RESULTS AND DISCUSSION
It was discovered that Panti Recreational Forest provided various ecosystem services to the local community for their well beings. As the list of possible drivers of change that are relevant to Panti Recreational Forest were provided in the questionnaire, it helps respondents in determining the most plausible ecosystem services and the possible threats that affecting the site. To determine the impact score of expected threats, the timing, cope and impact scores were summed to give a total of impact score. Then, the score was divided into three groups to obtain the mean impact score. On the other hand, the perceived value of ecosystem services was calculated to determine the most important ecosystem services that are relevant and valued by respondents.

Impacts Score of the Expected Threats
This study found out that water management issue received the highest score that might happened in the next 10 years according to the stakeholders' analysis. It is believed due to the usage of water supply in the daily life of community especially for drainage system for gardeners. Local communities are using the water supply directly from Panti Recreational Forest for daily use and drainage system. Meanwhile, the lowest score threat to site is residential & commercial development. For the current period, the authorities will not carry out any development of residential or commercial areas that involve the Panti Recreational Forest. This is because, when large-scale area development takes place, it can involve Panti Recreational Park being affected. Indirectly, Panti Recreational Park is easily invaded by outsiders that could contribute to the degradation of the natural biodiversity in the area.

Table 1: Mean impact score for major threats to ecosystem services

Threats to site	Mean impact score (minimum = 1, maximum = 9)
Fishing & harvesting other aquatic resources	4.9
Water-based tourism activities	5.2
Water management & use	5.6
Human disturbance	5.1
Climate change & weather such as flood and global warming	5.0
Animal hunting & trapping	4.6
Gathering terrestrial plants	4.9
Pollution	4.3
Agriculture & aquaculture	5.2
Environmental conservation action	5.0
Transportation & access corridors	4.9
Residential & commercial development	4.4
Energy production & mining	4.7
Logging/ wood harvesting	4.9
Fire	4.5

Perceived Value of Services

The graph below shows the perceived value of ecosystem services provided by Panti Recreational Forest. According to the stakeholders' opinion, the highest score perceived value is recreation/ tourism with a record of 7. Panti Recreational Forest is a well-known place that with a rich diversity of flora and fauna that could attract tourists for nature conservation education purposes. Not only that, knowledge about ecosystem services of the forest will lead to a higher appreciation of the natural ecosystem found in the area around where they live. Meanwhile, the lowest score perceived value is harvested wild goods with a record score of 3.0. This is due to the prohibition in harvesting wild goods directly from the forest for the purpose of biodiversity preservation.
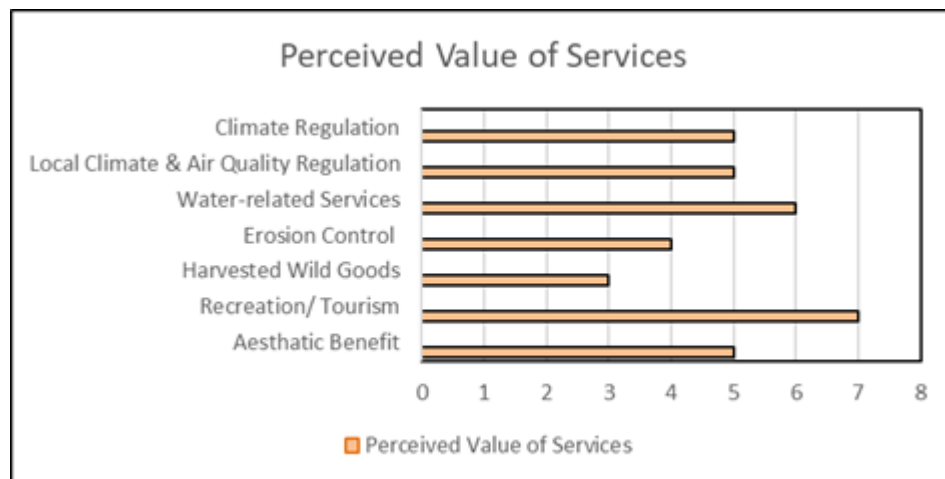

Figure 2: Perceived value of ecosystem services

CONCLUSION

Diverse stakeholders are involved in the management of Panti Recreational Forest, some with conflict of interest. Therefore, the engagement of stakeholders is very important to provide a clear understanding of the value of ecosystem services offered by the forest.

This action helps planners and managers in the enforcement of management actions that should be acceptable to all of them. The result of this study will help to identify stakeholders affected by the management decisions and to be included in management strategies for biodiversity conservation and ecosystem services delivery, especially for

recreational forest planning and management. Furthermore, TESSA is seen as an effective toolkit in guiding non-specialist and empower local users in assessing ecosystem services while applying flexible methods that could be adapted in planning and management of recreational forest.

REFERENCES

Book
Baral H., Jaung W., Bhatta L.D., Phuntsho S., Paudyal K., Zarandian A., Sears R.R., Sharma R., Dorji T. & Artati Y. (2017). *Approaches and Tools for Assessing Mountain Forest Ecosystem Services.* Working Paper 235. Bogor, Indonesia: CIFOR.

Guillermo M.P., Ajith H.P., Urmas P. & Louis R. I. (2018). *Ecosystem Services from Forest Landscape: An Overview*. Switzerland: Springer International Publishing.

Martin-Lopez, B., Oteros-Rozas, E., Cohen-Shacham, E., Santos-Martin, F., Nieto-Romero, M., Carvalho-Santos, C., Antonio González, J., Garcia Llorente, M., Klass, K., Geijzendorffer, I. R., Montes, C. & Cramer, W. (2016). *Ecosystem Services Supplied by Mediterranean Basin Ecosystems.* In Handbook of Ecosystem Services. New York, USA: Routledge.

Millennium Ecosystem Assessment Panel (MEA). (2005). Washington, USA: Island Press.

Muoria P., Field R., Matiku P., Munguti S., Mateche E., Shati S. & Odeny D. (2015). *Yala Swamp Ecosystem Service Assessment*. Nature Kenya.

TEEB. (2010). *The Economics of Ecosystems and Biodiversity Ecological and Economic Foundations*. Edited by Pushpam Kumar. London and Washington: Earthscan.

Journal
Abson, D. J., von Wehrden, H., Baumgärtner, S., Fischer, J., Hanspach, J., Härdtle, W., Heinrichs, H., Klein, A. M., Lang, D. J., Martens, P., & Walmsley, D. (2014). Ecosystem Services as a Boundary Object for Sustainability. *Ecological Economics, 103*, 29 – 37.

Guerry, A.D., Polasky, S., Lubchenco J., Chaplin-Kramer R., C. Daily, G., Griffin, R., Ruckelshaus, M., J. Bateman, I., Duraiappah, A., Elmqvist, T., W. Feldman, M., Folke, C., Hoekstra, J., M. Kareiva, P., L. Keeler, B., Li, S., McKenzie, E., Ouyang, Z., Reyers, B., H. Ricketts, T., Rockström, J., Tallis, H., Vira, B. (2015). Natural Capital and Ecosystem Services Informing Decisions: From Promise to Practice. *PNAS, 112*(24), 7348-7355.

Gustafsson, L., C. Baker, S., Bauhus, J., J. Beese, W., Brodie, A., Kouki, J., B. Lindenmayer, D., Lõhmus, A., Pastur, G. M., Messier, C., Neyland, M., Palik, B., Sverdrup-Thygeson, A., A. Volney, W. J., Wayne, A. & F. Franklin, J. (2012). Retention Foresty to Maintain Multifunctional Forests: A World Perspective. *Bioscience, 62*(7), 633 – 645.

Hussein M.K. (2014). Sustainability of Three Recreational Forest Landscape Management in Selangor, Malaysia. *Journal of Design and Built Environment, 14*(2), 1-16.

Jose A.A., Luis J.B., Maria J.L. & Juan F.V. (2018). Forest Ecosystem Services: An Analysis of Worldwide Research. *Forests, 9*(8), 453.

Levin S.A. & Lubchenco J. (2008). Resilience, Robustness and Marine Ecosystem-Based Management. *Bioscience, 58*(1), 27 – 32.

Martines P.G., Peri P.L., Lencinas M.V., Garcia L.M. & Martin L.B. (2016). Spatial Patterns of Cultural Ecosystem Services Provision in Southern Patagonia. *Landscape Ecology, 31*, 383 – 399.

Martins K.T., Gonzales A. & Lechowics M.J. (2015). Pollination Services are Mediated by Bee Functional Diversity and Landscape Context. *Agriculture Ecosystem Environment,*

200, 12 –20.

Nieto-Romero, M., Oteros-Rozas, E., Gonzales J.A. & Martin-Lopez B. (2014). Exploring the Knowledge Landscape of Ecosystem Services Assessments in Mediterranean Agroecosystem: Insights for Future Research. *Environmental Science Policy, 37*, 121-133.

Paletto A., Balest J., De Meo I., Giacovelli, G. & Grilli G. (2019). Power of Forest Stakeholders in the Participatory Decision Making Process: A Case Study in Northern Italy. *Acta Silvatica et Lignaria Hungarica, 12*(1), 9-22.

Paletto A., Giacovelli G., Grilli G., Balest J. & De Meo I. (2014). Stakeholders' Preferences and the Assessment of Forest Ecosystem Services: A Comparative Analysis in Italy. *Journal of Forest Science, 60*(11), 472 – 483.

Pan, Y., Birdsey, R. A., Fang, J., Houghton, R. A., Kauppi, P., Kurz, W. A., Phillips, O. L., Shvidenko, A., Lewis, S., Canadell, J. G., Ciais, P., Jackson, R. B., Pacala, S. W., McGuire, A. D., Piao, S., Rautiainen, A., Sitch, S., & Hayes, D. (2011). A Large and Persistent Carbon Sink in the World's Forests. *Science, 333*(6045), 988 –993.

Peh, K. S.-H., Balmford, A., Bradbury, R. B., Brown, C., Butchart, S. H. M., Hughes, F. M. R., Stattersfield, A., Thomas, D. H. L., Walpole, M., Bayliss, J., Gowing, D., Jones, J. P. G., Lewis, S. L., Mulligan, M., Pandeya, B., Stratford, C., Thompson, J. R., Turner, K., Vira, B., Willcock, S., & Birch, J. C. (2013). TESSA: A Toolkit for Rapid Assessment of Ecosystem Services at Sites of Biodiversity Conservation Importance. *Ecosystem Services, Elsevier, 5,* 51 – 57.

Seppelt R., Dormann C.F., Eppink F.V., Lautenbach S. & Schmidt S. (2011). A Quantitative Review of Ecosystem Services Studies: Approaches, Shortcomings and the Road Ahea. *Journal of Applied Ecology, 48*(3), 630- 636.

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