Online taxi and green sustainable concept: what the literature says?

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Abstract. Online taxi is a transportation mode that mostly grows in urban area. It integrates online technology from cellular phone application to offline activities in its service. This transportation mode is an example of ride sharing concept. This transportation emergence has generated positive and negative impact, where many studies had discussed that. Any kind of transportation mode has an impact to the environment. However the online taxi impact on the environment has rarely been heard. This article aimed to identify the recent studies on the relation of online taxi with green concept. Using Systematic Literature Review and thematic analysis method, the result of research showed that many studies mentioned online taxi is closely related to the green concept. In addition to that, there are still limited number of studies conducted on the policy connecting online taxi to green sustainable energy. Discussion and implication of research was discussed further in the article.

1. Introduction
Sharing economy concept has developed all over the world today. This business model attracts much attention due to the prevalence of on-demand application connected to cellular phone and generating pros and cons [1]. Sharing economy is essentially characterized with the exchange of advantage in product renting or service with internet application help. The form of sharing economy includes such sectors as mobility, accommodation, labor, and etc. [2]. The growth of sharing economy also requires the management change in public sector in order to be more adaptive and provide service corresponding to the people demand [3,4]. This adaptation is important to do as it adapts to the change of society structure and culture affected by environment.

Transportation sector is one of strategic sectors that is also affected by sharing economy concept, for example, the emergence of online taxi. This sector is the largest one in sharing economy, thereby requiring much more attention [2]. In the existing literature, there are many terms having parallel meaning with taxi online: ride sharing O2O taxi (online to offline taxi), and some other similar terms. In this study terms online taxi and ride sharing were used interchangeably to refer to the same concept. This online taxi transportation mode flourishes in urban areas. In online taxi, there is an application bridging the passenger and the driver [5] equipped with GPS (Global Positioning System) location detection that facilitates the online transportation driver to go to the passenger ordering it [6].

There are some controversies in a response to this emergence of transportation mode. For example, this transportation mode is considered as an unmatched (unequal) competitor thereby generating conflict between online and offline (conventional) taxis [7]. In addition, government regulation is considered to
be still in “grey” area, thereby having no law certainty [8]. For that reason, some countries respond to this issue by prohibiting while some others were, allowing, the existence of online taxi with some requirements [1,9,10]. On the other hand, this mode is considered as providing job opportunity and profitable to those in cooperation (such as restaurants, shops, and etc.) [11]. In South East Asia areas, online taxi form is not only car but also in the form of motorcycle hence it opens more job opportunities.

As a strategic area, to go toward modern transportation, ideally transportation should consider not only rapidity, efficiency, and capacity of transportation mode development, but also its contribution to the environment. The development of urban transportation has resulted in environmental problem, thereby requiring green sustainable transport strategy as the attempt of mitigating the problem [12]. Green sustainable transportation is essentially an organization of environment-friendly transportation taking its sustainability into account. In relation to urban transportation, city planners and author pay much attention because of the environmental issue generated [13]. Transportation management running so far is still traditional and focuses on improving movement and safety only regardless its effect on environment (green) and energy [14]. When using transportation, we are inseparable from the energy consuming pattern impacting on the environment conservation [2]. In reality, the volume of energy is getting smaller, while the growth of vehicle number increases and the fuel consumption is getting larger. It is an inseparable green dilemma [14,2]. Ride Sharing is considered as encouraging the realization of green sustainable energy by reducing the environmental effect of transportation use [15,16]. On the other hand, it also becomes boomerang due to consumption process done [2]. Referring to pros and cons of online taxi and green sustainable, a study should be conducted on what has been conducted by previous studies. This study is intended to seek the recent studies on the possible relations between online taxi and the environment (green).

2. Method
This article employed systematic literature review (SLR) by identifying, assessing, and interpreting all findings of a research topic to answer the specified research question [17]. This article was a literature review study on international journals published from 2014 to 2018 related to online taxi and green sustainable issue. This limitation of period was made because online transportation began to flourish in the last five years and to make the literature obtained up-to-date. The database employed included Scopus and Science direct. These databases were selected because both of them are reputable and many academicians refer to them. Two keywords used in the searching were “online taxi” and “green sustainable”. Keyword online taxi in practice is paralleled with the searching for the name of online taxi and ride sharing companies. Meanwhile, keyword green sustainable was searched with relevant issue such as environment and pollution. The detail of keyword used can be seen in Table 1.

| Table 1. Keywords. |
|-------------------|-----------------|
| **Online taxi**   | **Green Concept** |
| As company name (uber, grab, go-jek) and O2O taxi (online to offline taxi) | Environment |
| As ride sharing | Pollution |

3. Result and discussion
This section is divided into three parts: searching literature, categorizing literature and thematic analysis. Searching literature was conducted to look for literature that is related topic. After the literature has been relevant, literature categorization was conducted. Thereafter, further analysis was conducted using thematic analysis.

3.1. Literature searching
Literature searching was conducted on 2 (two) research databases aforementioned, access from 24-03-2018 to 24-04-2018 or equal to 1 month of searching with keywords “online taxi” and "green
sustainable”. The first attempt used two keywords resulting in zero result for searching in scopus and science direct databases. The second measure of searching keywords green sustainable was taken using relevant issues (environment, pollution), online taxi using direct term of company name (uber, grab, gojek) and O2O taxi (online to offline taxi) in the two databases. The third measure of searching environmental dilemma-related issues was conducted using keywords online taxi and ride sharing. The summary of literature searching result can be seen in Table 2.

Table 2. Literature searching summary.

| Online taxi                     | Green Concept | Literature Total |
|---------------------------------|---------------|------------------|
|                                 | Scopus        | Science Direct   |
| As company name (such as:       |               |                  |
| uber, grab, gojek)              | 9             | 10               |
| and as online to offline taxi   | 2             | 3                |
|                                 | 11            | 13               |
| As ride sharing                 |               |                  |
| environment                     | 21            | 251              |
| Pollution                       | 12            | 37               |
|                                 | 33            | 288              |
| Total                           | 44            | 301              |

Table 2 shows that 44 literatures are obtained from Scopus database, and 301 from Science direct. These numbers are pure ones, because it has not passed the filter to see whether or not there are same articles in each of literatures obtained from keyword searching.

3.2. Literature categorizing

Generally, the category of literature in this study is divided into 3: (1) only citing without using it in the study (citing in introduction section only), (2) citing it and use it in the study (citing it in introduction and discussion sections), and (3) irrelevant article. The category builds on the depth of keywords discussion in the literature obtained. Unfortunately, majority papers obtained are not relevant to the purpose of study. The result of literature category in this research can be seen in table 3.

Table 3. Literature category summary.

| Category                        | Scopus | Science Direct | Total | %  |
|---------------------------------|--------|----------------|-------|----|
| introduction                    | 18     | 39             | 57    | 16,5|
| introduction and discussion     | 5      | 15             | 20    | 5,8 |
| irrelevant article              | 21     | 247            | 268   | 77,7|
| Total                           | 44     | 301            | 345   | 100|

The table above shows that 16.5% of literatures obtained cite in introduction section only, while 77.7% are not relevant to the purpose of study. Furthermore, the analysis is limited to the relevant literature in result and introduction section. It is conducted because this study focuses on the literature actually conducting research on green sustainable issue, rather than citing for introduction section only.

3.3. Thematic analysis

The next measure is to conduct thematic analysis on the literature obtained. This analysis was conducted by means of identifying the patterned themes from the literature obtained. Generally, the result of analysis can be seen in the table below:
Table 4. Thematic analysis summary.

| Theme                           | Total | Authors                                                                 |
|---------------------------------|-------|-------------------------------------------------------------------------|
| Reducing Emission               | 17 (85%) | [1][18], [19], [20], [21], [22], [23], [24], [25], [26], [27], [28], [29], [30], [31], [32] |
| Reducing Cost                   | 9 (45%)  | [19], [33], [34], [20], [22], [30], [26], [28], [1]                    |
| Reducing Congestion             | 15 (75%) | [18], [19], [34], [20], [23], [30], [25], [26], [27], [28], [2], [1], [29], [24], [32] |
| Efficiency of parking area      | 1 (5%)   | [34]                                                                    |
| Reducing Fuel consumption       | 8 (40%)  | [1], [34], [21], [30], [35], [1], [29], [24]                           |
| Save time                       | 2 (10%)  | [33], [27]                                                              |

Figure 1. Theme category.

From table 4 and figure 1, it can be seen that reducing CO2 emission is dominant in previous studies about the relations between online taxi and green sustainable concept (17 out of 20 literatures). In addition to that reducing fuel consumption that is also closely related with the environment issues also rank number three in the Fig 1 with (8 out of 20 literatures). This two findings had indicated the close relations between online taxi and green sustainable concept.

Another finding shows that only one study that discuss the importance of government policy in the relations between taxi online and green sustainable concept. It indicates the researchers’ low interest in studying this area of research. Thus, further studies should be conducted on green energy sustainability issue in order to give empirical input to government.

4. Conclusion
The discussion gives insight on the relationship between online taxi and green sustainable energy. It is indicated by prior studies that online taxi as part of the ride-sharing concept has relation with green sustainable concept. This insight might add the government policy dimension of the online taxi presence. The result in this study also suggest further study to put more attention on how government policy in relation to online taxi and green sustainable concept is issued.

Another interesting finding in this study is the limited studies conducted on the ride sharing policy related to green sustainable energy. Meanwhile, such research is important to encourage the government to issue a policy about online taxi in which some states or areas still refuse the existence on online taxi [1]. Therefore, the research on online taxi in relation to environment should be conducted to give awareness of the importance of online taxi in order to preserve the environment.
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References
[1] T Cetin, and E Deakin 2017 Regulation of taxis and the rise of ridesharing, *Transp. Policy* **30**, 1–10
[2] S Ganapati, C G Reddickb 2018 Prospects and Challenges of Sharing Economy for the public sector, *Gov. Inf. Q.*, **35**, 77–87
[3] M Janssen, and H Voort 2016 Adaptive governance: Towards a stable, accountable and responsive government *Gov. Inf. Q.*, **33**, 1–5
[4] I Mergel, and Agile innovation management in government: A research agenda *Gov. Inf. Q.*, **33**, 516–523
[5] J Shen, F Qiu, W Li, and P Feng 2015 Exploring the Effect of the Telephone/Online Booking System on Taxi Service: Case Study of Suzhou City in China In:15th COTA Int. Conf. Transp.Prof
[6] J W Chan, V L Chang, W K Lau, CJ Lei, 2016 Taxi App market analysis in Hong Kong *J. Econ.*, *Bus. Manage* **4** (3), 239–242
[7] S Harding, M Kandlikar, and S Gulati 2016 Taxi apps, regulation, and the market for taxi journeys *Transp. Res. Part A* **88**, 15–25
[8] D Dupuy 2017 The Regulation of Transportation Network Companies *Agora*, 114-122
[9] N DuPuis, and B Rainwater 2015 *Shifting perception of collaborative consumption* (Washington DC: National League of Cities)
[10] D D Acevedo 2016 Reg employment relationships in the sharing economy *Empl Rights & Employ Policy J.* **20** (1), 1–36
[11] B Cohen, J Kietzmann 2014 RideOn! Mobility Business Models for the Sharing Economy *Organ Environ*, **27**(3), 279–296
[12] J Zhao 2013 The Development of Green Sust. Transportation in China” *Sust.Transport for Chinese Cities, Transp. Sustain.*, **3**, 99–117
[13] S M Hatefi 2018 Strategic planning of urban transportation system based on sustainable development dimensions using an integrated SWOT and fuzzy COPRAS approach *Global J. Environ. Sci. Manage* **4**(1); 99-112
[14] F AlRukaibi, S AlKheder, D Al-Rukaibi, and A Al-Burait 2018 The impact of highway base-saturation flow rate adjustment on Kuwait's transport and environmental parameters estimation *Sci. Total Environ.* **633**, 560-570
[15] Y Zhang, Y Zhang 2016 *Internetp: Engine of Sharing Economy Development* (Beijing: Guangming Daily)
[16] Y Ma, K Rong, D Mangalagiu, T F Thornton, and D Zhu 2018 Co-evolution between urban sustainability and business ecosystem innovation: Evidence from the sharing mobility sector in Shanghai *J. Clean Prod.*, **188**, 942-953
[17] B Kitchenham, and S Charters 2007 Guidelines for performing systematic literature reviews in software engineering *Technical report, Ver. 2.3 EBSE Technical Report. EBSE*
[18] J Jung, R Jayakrishnan, and K Choi 2016 Dually sustainable urban mobility option: Shared-taxi operations with electric vehicles, *Int. J. Sustain. Transp.*, **11**(8) pp567–581
[19] R Ma, M Jin, P Ren, and P Greenhouse 2016 gas emission savings with dynamic ride-sharing *Revista de la Facultad de Ingenieria* **31**(5), 152-162
[20] A Chowdhury, A Jamal, R Alam, and R Palit 2017 Campus ride: An environment-friendly ride sharing platform for academic institutions *Proceedings - 2016 16th IEEE Int. Conf. Comp. Inf. Technol.*, 120-124
[21] B Barann, D Beverungen, and O Müller 2017 Co-evolution between urban sustainability and business ecosystem innovation: Evidence from the sharing mobility sector in Shanghai An open-data approach for quantifying the potential of taxi ridesharing. Decisi. Support Syst., 99, 86–95

[22] K Stewart 2015 Assessing the Carbon Impact of ICT Measures: A Case Study Investigation Using Latis1 Model Int. J. Transp. Sci. Technol., 4(2), 277 – 134

[23] L M Martinez, and J M Viegas 2017 Assessing the impacts of deploying a shared self-driving urban mobility system: An agent-based model applied to the city of Lisbon, Portugal. Int. J. Transp. Sci. Technol., 6 13–27

[24] M Vanderschuren 2018 Ride-sharing: A potential means to increase the quality and availability of motorised trips while discouraging private motor ownership in developing cities? Res. Transp. Econ.

[25] T Wu, Q Shen, M Xu, T Peng, and X Ou 2018 Development and application of an energy use and CO2 emissions reduction evaluation model for China's online car hailing services Energy

[26] N Rabbitt, B Ghosh 2016 Economic and environmental impacts of organised Car Sharing Services: A case study of Ireland Res. Transp.Econ., 57, 3-12

[27] R Guidotti, M Nanni, S Rinzivillo, D Pedreschi, and F Giannotti 2017 Never drive alone: Boosting carpooling with network analysis Inf. Syst., 64, 237–257

[28] A K Bhoopalam, N Agatz, and R Zuidwijk 2018 Planning of truck platoons: A literature review and directions for future research Transp. Res. Part B 107

[29] G Lyons, P Mokhtarian, M Dijst, and L Böcker 2018 The dynamics of urban metabolism in the face of digitalization and changing lifestyles: Understanding and influencing our cities Resour., Conserv. Recycli., 132, 246–257

[30] C Cleophas, C Cottrill, J F Ehmke, and K Tierney 2018 Collaborative Urban Transportation: Recent Advances in Theory and Practice Eur. J. Oper. Res.,

[31] D Murillo, H Buckland, and H E Val 2017 When the sharing economy becomes neoliberalism on steroids: Unravelling the controversies Technol. Forecast. Soc. Chang., 125, 66–76

[32] B Yin, L Liu, N Coulombel, and V Iguié 2017 Evaluation of ridesharing impacts using an integrated transport landuse model: a case study for the Paris region Transp. Res. Procedia 27, 824–831

[33] H Meng, L Ran, J Chen, and Z Jiao 2017 Goal-Driven Approach to Optimize Matching Mechanism in Electric Vehicles Ride-Sharing System Energy Procedia 105, 2273-2280

[34] C Toth 2015 Carpooling in Hungary: Can it reduce the GHG emissions of personal transport? European Transport – Trasp. Eur., 58

[35] X He, Y Wua, S Zhang, M A Tamor, T J Wallington, and W Shen 2016 Individual trip chain dist. for passenger cars: Implication for market acceptance of battery electric vehicles and energy consumption by plug-in hybrid electric vehicles Appl. Energy 180, 650–660