Moving towards Smart Sustainable Communities: A Systematic Literature Review

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Abstract: Land-use planning, urban smart housing, and urban transport are important determinants for green space policies. The ecosystem service approach has helped scholars to attract policy attention to these benefits, but the concept remains poorly implemented in urban policy and governance. Within this context, what is needed is a bridge between ecosystem services and policy processes. This can be accomplished through Multi-Criteria Decision Analysis (MCDA) as a decision support tool. Research in Land Use & Urban Governance will also need to investigate whether the two trends of increased digitization within governance and increased participatory mechanisms. This will help develop a more robust understanding of the institutional, technological and social conditions that act as barriers or incentives for inclusion, via the lens of empirical cases both situated within Sri Lanka and Sweden. It draws on the concept of "Citizen Observatories" that is gaining traction within the academic community focusing on GIS and Urban Planning. By fostering collective interaction between different stakeholders, citizen observatories provide communities with increased influence in decision making, allowing them to contribute first-hand to key economic, social and environmental issues. To investigate this issue broadly and scientifically, the 'Systematic Review' was conducted. It would pave the way for completing this task successfully. This review included both

quantitative and qualitative research articles conducted to investigate the research questions, research designs, methodologies adopted, etc. in the field of urban planning with special reference to smart, sustainable communities.

Keywords: Urban Planning, Smart Sustainable Communities, Citizen Observatory, Public Participation

Introduction
Research Area
Land-use planning and urban transport are important determinants for green space policies. Land use defines the structure and function of urban and rural ecosystems and the benefits these provide to humans, such as air purification, runoff mitigation, and sustainable habitation. While urban transport addresses the flows of resources, emissions and energy consumption needed to support our current urban and rural realities. The ecosystem service approach has helped scholars to attract policy attention to these benefits, but the concept remains poorly implemented in urban policy and governance. Within this context, what is needed is a bridge between ecosystem services and policy processes. This can be accomplished through Multi-Criteria Decision Analysis (MCDA) as a decision support tool. A key strength of this tool in informing green space policies lies in its capacity to accommodate conflicting stakeholder perspectives and to address trade-offs between ecological, social and economic values.

Research within this area of Land Use & Urban Governance will also need to investigate whether the two trends of increased digitization within governance (be it via GIS or policy modelling) and increased participatory mechanisms within decision making are shaping the relationship between state and civil society today. This will help develop a more robust understanding of the institutional, technological and social conditions that act as barriers

or incentives for inclusion, via the lens of empirical cases both situated within Sri Lanka and Sweden. Here we can draw on the concept of "Citizen Observatories" that is gaining traction within the academic community focusing on Geographic Information Systems (GIS) and Urban Planning. These observatories are community-based environmental monitoring and engagement systems to inform science and policy. Their shared design and activation provide key tools for decision makers and empower communities to be part of the solutions to this global environmental challenge. By fostering collective interaction between different stakeholders, citizen observatories provide communities with increased influence in decision making, allowing them to contribute first-hand to key economic, social and environmental issues. At DSV, we currently are engaged in an EU H2020 project called Ground Truth 2.0 that addresses this very research question, where this proposed research can make a valuable contribution.

Problem Identification

Sweden and Sri Lanka are two countries located in two continents, namely; Europe and Asia. The level of development with respect to socio-economic, and physical achievement along with the technological application is vast. Sweden is among the top 10 countries based on the inequality-adjusted human development index (IHDI), as published by the UNDP in its 2016 Human Development Report. Sri Lanka is ranked as 46. Sweden is represented as a highly developed country while Sri Lanka can be categorized as a developing country which has attained a moderately high IHDI due to its socio-economic achievement. However, it is worthwhile to highlight the fact that Sri Lanka is lagging its physical development, mainly urban planning, urban housing and transport due to its inherent weakness for decades. For example, Colombo City comprises of nearly 50% of its population living in under-served settlements such as slums and shanties.

Further, the cost of traffic congestion due to substandard urban transportation system especially in Colombo City is calculated to be a massive amount. Therefore, it is pertinent to investigate this socio-economic phenomenon and physical development achievement on a comparative basis, a developed country perspective and a developing country perspective. Based on this phenomenon, the following research question is formulated for further investigation.

Research Question of the proposed study: Whether the policy framework, practices and experience of urban planning, mainly smart sustainable communities adopted in selected municipalities in Sweden, mainly Stockholm, can be applied to municipalities or urban set up in Sri Lanka, a developing country?

Methods
This review was conducted based on the systematic literature review process. A systematic review is a review of the research literature whose aim is to arrive at a conclusion about the state of knowledge on a topic based on a rigorous and unbiased overview of all the research that has been undertaken on that topic. For this purpose, the selection of the articles was based on the research area of urban planning, mainly; smart sustainable communities. The theme of the research proposal is ''Decision Support and GIS within Urban Planning: Moving towards Smart Sustainable Communities'.

Research Questions
As this article is to review the research articles published in various journals, it is essential to identify the major sources including databases. Therefore, the following research questions were used for this purpose:

RQ1: What are the research questions and goals set on smart, sustainable communities and related fields?

RQ2: What research design and methodologies have been used in studies on determinants of developing sustainable communities?

RQ3: What are the research findings in a systematic literature review in the selected field?

Literature Search

A total of four scientific databases were chosen to search for articles, namely; Scopus, Web of Science, Emerald Insight, and ScienceDirect. This section covers all relevant aspects of the literature search (search words, databases, inclusion and exclusion criteria and the number of papers found at each state) and description of how the analysis based.

Key Words used: urban planning, land use, multi-criteria decision analysis, public participation, smart, sustainable communities, geographic information system, decision support, citizen observatory shown in Table 1.

The method used for searching articles is as follows:

Table 1. Combinations of keywords used in the research literature review

No	Keywords used
1	"Urban Planning"
2	"Land Use"
3	"Multi-Criteria Decision Analysis"
4	"Public Participation"
5	"Smart Sustainable Communities"
6	"Geographic Information System"
7	"Decision Support"
8	"citizen observatory."

Inclusion and Exclusion Criteria: The main inclusion criteria were the completed articles on urban planning focusing on smart, sustainable communities, citizen participation, GIS, MCDA and

published during 2015 – 2018. The main exclusion criteria were research-in-progress articles, articles not published in peer-reviewed journals, articles published as book chapters, duplicate articles, and articles written in languages other than English. Finally, the year published review of titles, review of abstract, and final filtering based on research design and strategy and findings. This information is shown in Table 2.

Table 2. Inclusion/exclusion criteria in the literature review

Step	Studies Included	Studies Excluded
1	Initial Search Results - 605	Year of Reference limited to 2015 – 2018 Excluded 480
2	Short List - 125	Review of Titles Excluded - 81
3	Review of Abstract - 44	Excluded based on details in the Abstract Excluded - 15
4	Review of Methods - 29	Final Filtering Studies excluded based on the Research Design, the relevance of the findings Excluded - 04
5	Findings Reviewed – 24	

Table 3 summarizes the articles reviewed under a qualitative and quantitative basis.

Table 3. Reviewed Articles under Qualitative and Quantitative Approach

No	Qualitative	Quantitative
01	Mihai A, Marincea A, Ekenberg L (2015) A MCDM Analysis of the Roşia Montană Gold Mining Project.	Badland H, Mavoa S, Boulangé C, et al. (2017) Identifying, creating, and testing urban planning measures for transport walking: Findings from the Australian national liveability study.
02	Antonson H, Hrelja R, Henriksson P (2017) People and parking requirements: Residential attitudes and day-to-day consequences of a land use policy shift towards sustainable mobility. Land use policy	Zubelzu S, Álvarez R, Hernández A (2015) Methodology to calculate the carbon footprint of household land use in the urban planning stage. Land use policy
03	Gutiérrez V, Theodoridis E, Mylonas G, et al. (2016) Co-creating the cities	Wang C, Wang Y, Wang R, Zheng P (2018) Modeling and evaluating land-

	of the future. Sensors (Switzerland)	use/land-cover change for urban planning and sustainability: A case study of Dongying city, China.
04	Perveen S, Kamruzzaman M, Yigitcanlar T (2017) Developing policy scenarios for sustainable urban growth management: A Delphi approach.	Ebrahimian Ghajari Y, Alesheikh AA, Modiri M, et al. (2018) Urban vulnerability under various blast loading scenarios: Analysis using GIS-based multi-criteria decision analysis techniques. Cities
05	Pettit C, Bakelmun A, Lieske SN, et al. (2017) Planning support systems for smart cities.	Kourtit K, Nijkamp P (2018) Big data dashboards as smart decision support tools for i-cities – An experiment on Stockholm. Land use policy
06	Mardani A, Zavadskas EK, Khalifah Z, et al. (2017) A review of multi-criteria decision-making applications to solve energy management problems: Two decades from 1995 to 2015. Renew Sustain Energy	Niehaus M, Galilea P, Hurtubia R (2016) Accessibility and equity: An approach for wider transport project assessment in Chile.
07	Marsal-Llacuna M-L, López-Ibáñez M-B (2014) Smart Urban Planning: Designing Urban Land Use from Urban Time Use.	Abastante F, Lami I, Lombardi P (2017) An Integrated Participative Spatial Decision Support System for Smart Energy Urban Scenarios: A Financial and Economic Approach.
08	Sanesi G, Colangelo G, Lafortezza R, et al. (2017) Urban green infrastructure and urban forests: a case study of the Metropolitan Area of Milan.	Subasinghe S, Estoque R, Murayama Y (2016) Spatiotemporal Analysis of Urban Growth Using GIS and Remote Sensing: A Case Study of the Colombo Metropolitan Area, Sri Lanka.
09	Fenton P (2017) National infrastructure, small towns and sustainable mobility–experiences from policy and strategy in two Swedish municipalities.	Baudry G, Macharis C, Vallée T (2018) Range-based Multi-Actor Multi-Criteria Analysis: A combined method of Multi-Actor Multi-Criteria Analysis and Monte Carlo simulation to support participatory decision making under uncertainty.
10	Gagliardi D, Schina L, Sarcinella ML, et al (2017) Information and communication technologies and public participation: interactive maps and value added for citizens.	Guerreiro T de CM, Kirner Providelo J, Pitombo CS, et al. (2018) Data-mining, GIS and multicriteria analysis in a comprehensive method for bicycle network planning and design
11		Boggia A, Massei G, Pace E, et al.

		(2018) Spatial multicriteria analysis for sustainability assessment: A new model for decision making.
12		Sun Z, Deal B, Pallathucheril VG (2009) the land-use evolution and impact assessment model: A comprehensive urban planning support system.
13		Le Roux A, Augustijn PWM (2017) Quantifying the spatial implications of future land use policies in South Africa.
14		Wang Y, Montas HJ, Brubaker KL, et al. (2017) A Diagnostic Decision Support System for BMP Selection in Small Urban Watershed.

Rubrics selected for the analysis

This section covers the literature search under the Research objectives; Material included, Participants, Research Design and Strategy, Methods (Data Collection), Data Analysis, Results and Conclusions. The articles reviewed for writing this assignment basically include quantitative and qualitative research while some articles are based on a mixed approach. Table 4 summarizes the main rubrics applied with overall reference to articles reviewed.

Table 4. Rubrics used for Reviewed Articles

No	Rubrics Used	Main Areas of Concentration
1	Research Objectives and Research Questions	It was able to identify that most of the research conducted for urban planning and related areas. All research conducted was directed towards identifying urban issues, policies, and related areas and searching for solutions. Other research areas of environment and ecology related had their research questions and objectives in the fields.
2	Material included	In general, all research developed or utilized 'models', some are based on mathematics and statistics while some are based on descriptive pattern. Researchers extensively

		used mathematical and computer models.
3	Participants	Majority of the research used public or key-respondents including experts in the field for respective research.
4	Research Design and Strategy	Majority of the articles in the literature search belong to the quantitative approach, 14 and qualitative approach included 12 articles. However, there a few articles based are based on mixed methods. Most research strategies are based on 'case study'. It has been able to identify that all studies utilized 'systematic review' approach in designing the respective research so that it is possible to check the research process with respect to validity and reliability effectively.
5	Methods (Data Collection)	All most all methods of data collection techniques were used for the selected research under review. Among them, questionnaires, interviews, observation, documents, etc. were extensively used.
6	Measures/Analytical Tools (Data Analysis)	It has also observed that most of the research used quantitative while there is a substantial number of research used qualitative data analysis tools. Further, the mixed method, combining both qualitative and quantitative methods were used. Multicriterial decision analysis, GIS applications, Model building, and Decision Models were frequently employed as quantitative techniques. Qualitative techniques such as Grounded theory, Content analysis, Narrative analysis, Image-based data analysis, Discourse analysis, etc. were used for selected research review.
7	Results and Conclusions	This section covered the main outcomes of the research searched during the preparation of this assignment. As highlighted, most of the findings were based on an empirical approach due to the high level of application.

8	Credibility and Reliability (Validity and Dependability)	Though these criteria are mainly established for qualitative research, in general, they should be maintained for any research. All research under review established these important aspects of the research process and research outcome as prime importance. It has been able to identify that each research equipped with almost all information to check 'validity and reliability.'

Results

This section reveals the relevant articles reviewed for understanding and broadening the knowledge, skills and readiness for the proposed research work, namely; Decision Support and GIS within Urban Planning: Moving towards Smart Sustainable Communities.' During this process, it was possible to identify the variety of research design and strategies, research questions and objectives, data collection and data analysis techniques, and findings including interpretations.

Research Objectives and Research Questions

It was able to identify that most of the research conducted for urban planning and related areas. Most of the research objectives reviewed articles for this assignment were directed towards identifying urban issues, developing and testing policies, and searching for solutions (Badland et al.,2017). The next category of the research articles was focused to developing and formulating models and/or systems for decision making (Zubelzu et al.,2015) The main objectives highlighted in the review is shown in Table 5.

Table 5. Articles classified based on the Research Objectives

No	Research Objectives	Articles
1	Identifying urban issues, developing and testing policies, and searching for solutions	Badland et al (2017), Ebrahimian Ghajari Y, Alesheikh AA, Modiri M, et al (2018), Antonson H, Hrelja R, Henriksson P (2017), Gutiérrez V, Theodoridis E, Mylonas G, et al (2016), Kourtit K,

		Nijkamp P (2018), Niehaus M, Galilea P, Hurtubia R (2016), Perveen S, Kamruzzaman M, Yigitcanlar T (2017), Abastante F, Lami I, Lombardi P (2017), Subasinghe S, Estoque R, Murayama Y (2016), Guerreiro T de CM, Kirner Providelo J, Pitombo CS, et al (2018), Mardani A, Zavadskas EK, Khalifah Z, et al (2017), Sanesi G, Colangelo G, Lafortezza R, et al (2017), Fenton P (2017), Le Roux A, Augustijn PWM (2017)
2	Developing and formulating models and/or systems for decision making	Mihai et.al.(2015), Zubelzu et.al.(2015), Wang C, Wang Y, Wang R, Zheng P (2018), Baudry G, Macharis C, Vallée T (2018), Boggia A, Massei G, Pace E, et al (2018), Sun Z, Deal B, Pallathucheril VG (2009), Pettit C, Bakelmun A, Lieske SN, et al (2017), Marsal-Llacuna M-L, López-Ibáñez M-B (2014), Wang Y, Montas HJ, Brubaker KL, et al (2017), Gagliardi D, Schina L, Sarcinella ML, et al (2017)

Material included

In general, all research reviewed developed or utilized models and systems, and some are based on mathematics and statistics while some are based on descriptive pattern. Researchers extensively used mathematical, and computer-generated models (Wang et al.,2018). Some research areas utilized high-tech equipment including computers and different types of soft wares Ebrahimian, et al. (2018). The proposed research will also focus on developing appropriate models using Geographic Information Systems (GIS), Multi-Criteria Decision Analysis (MCDA) and Policy Modeling.

Participants

Since the main area of concentration in urban planning and related fields, the majority of the research employed public, different stakeholders, key-respondents, active and passive participants, including experts in the field in respective research Antonson et al., (2017). The proposed research is also based on public participation, and citizen observatories, the use of participants as respondents, key-informants, stakeholders, experts, etc. is required.

Research Design and Strategy

This assignment investigated both quantitative and qualitative research approaches. Majority of the articles are in quantitative approach (14) while the qualitative approach includes 07 articles as shown in Table 03 above.

Some research strategies are based on 'case studies' (Wang et al.,2018). It has been able to identify that all studies utilized 'systematic review' approach in designing the respective research so that it is possible to check the research process effectively. However, there was no specific article based only on systematic review. All in all, this literature search included main areas of research designs and strategies as shown in Table 06. Majority of the research in the review process were conducted through mixed methods (08) followed by case studies, (06) and surveys and sampling (06).

Table 6. Articles classified based on the Research Design and Strategies

No	Research Strategy	No of Articles	Articles
1	Case Studies	06	Mihai et.al. (2015), Wang et.al., (2018), Subasinghe S, Estoque R, Murayama Y (2016), Mardani A, Zavadskas EK, Khalifah Z, et al (2017), Sanesi G, Colangelo G, Lafortezza R, et al (2017), Fenton P (2017),
2	Surveys and Sampling	06	Zubelzu S, Álvarez R, Hernández A (2015), Antonson H, Hrelja R, Henriksson P (2017), Niehaus M, Galilea P, Hurtubia R (2016), Sun Z, Deal B, Pallathucheril VG (2009), Le Roux A, Augustijn PWM (2017), Gagliardi D, Schina L, Sarcinella ML, et al (2017)
3	Action Research	02	Badland H, Mavoa S, Boulangé C, et al. (2017), Wang Y, Montas HJ, Brubaker KL, et al. (2017)
4	Mixed Methods	08	Gutiérrez V, Theodoridis E, Mylonas G, et al (2016), Kourtit K, Nijkamp P (2018), Abastante F, Lami I, Lombardi P (2017),

			Baudry G, Macharis C, Vallée T (2018), Guerreiro T de CM, Kirner Providelo J, Pitombo CS, et al (2018), Boggia A, Massei G, Pace E, et al (2018), Pettit C, Bakelmun A, Lieske SN, et al (2017), Marsal-Llacuna M-L, López-Ibáñez M-B (2014),
5	Experiments	**01**	Ebrahimian Ghajari Y, Alesheikh AA, Modiri M, et al. (2018)
6	Phenomenology	**01**	Perveen S, Kamruzzaman M, Yigitcanlar T (2017)

Methods (Data Collection)

Almost all methods of data collection techniques were used for the selected research under review. Among them, questionnaires[9], interviews (*Kamruzzaman* et al., *2017)* , observation, documents Mihai et al. (2015) contemporary participatory methods(*Lami* et al.,2017), etc. were extensively used. These methods were employed in a mixed approach due to the nature of the disciplines, which are basically social science and humanity (cultural) domain *(Subasinghe* et al., *2016)* The proposed research would employ appropriate data collection techniques identified above as and when required. Since the main approach is qualitative, it requires to gather and analyze data simultaneously. Still, it is always possible to collect substantial secondary data from existing documents maintained by respective planning agencies in both countries, Sweden and Sri Lanka.

Measures/Analytical Tools (Data Analysis)

It has also observed that most of the research used qualitative while there is a substantial number of research used quantitative data analysis tools. Further, the mixed method, combining both qualitative and quantitative methods were used. Multi-criteria decision analysis(*Baudry* et al., *2018)*, GIS applications (*Guerreiro* et al., *2018)*], Model building (*Boggia* et al.,*2018)*, and Decision Models (*Sun* et al.,*2009*) were frequently employed as quantitative

techniques. Qualitative techniques such as Grounded theory, Content analysis, Narrative analysis, Image-based data analysis, Discourse analysis, etc. were used for selected research review. However, it has been identified that some of the research reviewed have employed a mixed approach.

Results and Conclusions

This section covers the main outcomes of the research reviewed during the preparation of this assignment. As highlighted, most of the findings were based on an empirical approach due to the high level of application in urban planning, mainly in decision making and policy development with special reference to smart, sustainable communities.

The following findings of the research titled as *'Planning support systems for smart cities'*emphasized the applicability of the research outcome: The results suggest that planning support system (PSS) can assist in undertaking key tasks associated with the planning process. The research demonstrates that PSS can assist in navigating the complexities of rapid multi-faceted urban growth to achieve better-informed planning outcomes. The paper concludes by outlining ways PSS address limitations of the past and can begin to address anticipated future challenges *(Pettit et al., 2017)*. The research titled *'A review of multi-criteria decision-making applications to solve energy management problems: Two decades from 1995 to 2015'* has focussed the decision-making environment. Results of this study acknowledge that decision making approaches can help decision makers and stakeholders in solving some problems under uncertainty situations in environmental decision making and these approaches have seen increasing interest among previous researchers to use these approaches in various steps of the environmental decision-making process(*Mardani* et al.,*2017)* . The findings on the study *'Smart Urban Planning: Designing Urban Land Use from Urban Time*

Use' emphasized the applicability of the research outcome: The opinions of citizens concerning how to cover their urban needs and associated time use allocation is used to establish equivalence results and recalibrate and improve current urban land use. In addition, this method stimulates and inspires public participation in the urban planning approval process, changing citizens from passive evaluators to active partners and designers (*Marsal-Llacuna et al., 2014)*. The results on the research titled *'Data-mining, GIS and multicriteria analysis in a comprehensive method for bicycle network planning and design'* show the application of the research outcome in the urban set-up. As a positive outcome, using disaggregated data allows for a reasonable estimate of the number of people served by the networks, a detailed analysis of their proximity to the infrastructure, as well as identifying potential users. Comparing cycling networks considering cost and benefit criteria shows that the chosen criteria were effective. It was also determined that the cycling network of the studied city poorly serves bicycle transport users if compared to the proposed networks. These findings indicate that appropriate methods for planning cycling networks are still needed (*Guerreiro et al.,2018)*. The outcome of the study on 'D*eveloping policy scenarios for sustainable urban growth management: A Delphi approach'* is related to policy formulation. The export-driven policy scenarios are validated in a local context by comparing findings against the policy options as proposed in the South East Queensland Regional Plan 2017, Australia. The findings offer valuable guidelines for planners, modellers, and policy makers in adopting suitable methods, indicators, and policy priorities, and thus, easing the daunting task of generating sustainable policy solutions (*Perveen et al., 2017)*. The results of the study on *'Urban green infrastructure and urban forests: a case study of the Metropolitan Area of Milan'* indicate the policy and planning decisions. The study analyses the main elements of urban green infrastructure (UGI) in the Italian context within the framework of the European

Union Life + project called Emonfur, a research program involving, inter alia, the establishment of an Urban Forest inventory and impact analysis of ecosystem services in the Metropolitan Area of Milan. This research has allowed determining the current status of key sites by monitoring the policy and planning decisions that resulted in their development. It is believed that such an analysis can pave the way to understand future land-use dynamics not only in northern Italy but in other metropolitan territories as well (*Sanesi et al.,* 2017). The result or outcome of the research on *'National infrastructure, small towns and sustainable mobility–experiences from policy and strategy in two Swedish municipalities'* highlighted policy and strategy in mobility. The results indicate that municipalities struggle to adopt coherent approaches to increasing sustainable mobility and continue to develop physical plans that induce use of motor vehicles, a trend reinforced by national investments in road infrastructure in peri-urban areas(*Fenton et al.,2017)*. The results of the study on *'Quantifying the spatial implications of future land use policies in South Africa'* indicated the application of models in forecasting future land use. Results indicated that the Policy-Led scenario could improve the wealth and economic distributions between the north and south of the city. It can also provide more economic opportunities for households living in the south of the city. Enforcing a UDB has a positive impact on urban sprawl and will result in increased densities across the city. The effect of the policies on the commuter distances indicated that both scenarios would lead to an overall increase in the number of households that have access to public transport, but the Policy-Led scenario will allow a greater number of low-income earners to have access to the public transport systems. It suggests that great possibilities for using the existing model to simulate land use change in South African cities. The model requires fewer input data compared to some other modelling techniques and with small adjustments and

adaptations can prove to be a useful tool for urban planners (*Le Roux et al.,2017).*

Credibility and Reliability (Validity and Dependability)
Though these criteria are mainly established for qualitative research, in general, they should be maintained for any research. All research under review established these important aspects of the research process and research outcome as prime importance. It has been able to identify that each research equipped with almost all information to check 'validity and reliability.'

Credibility (Validity)

This concept highlights the extent to which qualitative researchers can demonstrate that their data are accurate and appropriate.
- Respondent validation: Researcher can return the data and findings to the participants or respondents (research partners) as a means of checking the validity of the findings.
- Grounded data: Since the data are collected by using fieldwork and empirical means, qualitative research tends to spend long time on location. This provides a solid foundation for the conclusions based on the data which add high credibility.
- Triangulation: Researcher can use a different set of data to identify the accuracy and relevancy.

Reliability (Dependability)
This is simply the answer to the question, "Would the research instrument produce the same results when used by different researchers (all other things being equal)? Most research reviewed maintained the above criteria intact as important qualities of research. The reason for this outcome is that almost all research

based on empirical, investigative, and pragmatic approach. Further, they are grounded on a 'real-life situation' so that participants can respond to all stages of the research process *(Sanesi et al., 2017)*. To uphold the qualities of credibility and reliability in research is the responsibility of the researcher. When research is planned, it is always advisable to consider those factors in advance with due attention.

To improve the credibility as well as the reliability of qualitative studies, studies carried out in the form of case studies have applied different measures. The articles have presented a detailed account of the research methodologies. Triangulation is also used in different forms. For instance, some studies performed their data collection through multiple sources of evidence, such as interviews, observation and document analysis. A systematic review in this assignment has proven that most research, both qualitative and quantitative, maintained the validity and reliability.

Transferability and Confirmability (Generalizability and Objectivity)

Transferability is based on the question 'How can you generalize on the basis of such a small number?' This is an inherent issue with respect to the qualitative research approach in which a number of cases investigated or researched are small *(Le Roux et al.,2017)*. Confirmability suggests that it is difficult to separate the researcher from the data. For example, the data do not exist 'out there' waiting to be discovered as might be assumed if a positivistic approach were adopted. Data are produced by the way they are interpreted and used by researchers *(Perveen et al.,2017)*.

As identified, most research reviewed applied mixed methods and case studies as a research strategy *(Niehaus et al., 2016)*. Therefore, those researchers face the above aspects of research positively or negatively. However, this situation can be handled

with due care and attention when the researcher identifies the importance of transferability and confirmability of his/her research.

Discussion

This literature review has attempted to shed some light on the current state of studies on urban planning and related areas. The findings reveal that most of the studies are empirical and pragmatic in nature. The implications of the application of different methodologies in these studies will be presented in the following sub-sections.

Major findings

This section includes major findings associated with research review. Accordingly, it has been identified that almost all research was based on a pragmatic approach which was applied to 'real-life situations.' Therefore, the findings, in general, have a high level of application, mainly in problem-solving and introducing policy-framework.

To achieve the set objectives of the proposed research, it intends to focus on three different levels of the model explained in the introduction section above: conceptualization, elicitation, and calculation. The conceptualization section will introduce methods and projects as case studies both in Sweden and Sri Lanka which focus on the inequalities and conflicts within participatory processes including alternative public spheres and modes of communication. The elicitation section will describe research that focuses on the quantification of qualitative data, solving problems such as how to extract data in participatory processes where information is situated in a structure. The calculation section will focus on finding efficient processes to solve the quite complicated mathematical structures that these types of complex decision making can generate. Finally, overall research will employ tools and procedures from one or more of these different levels.

Since this area of research, namely; urban planning and urban transport has been a wide sphere for interdisciplinary approach of research, there are a massive number of research papers available in different sources. However, this report included only a few research articles searched using 'systematic review.' The research articles reviewed under quantitative and qualitative also highlighted the fact that some are directly applicable to the methodology proposed while some are not directly related.

Advantages and disadvantages of the qualitative and quantitative methods

Main advantages of qualitative methods are since the data are based on precise information; findings are also factual and not linked to the subjectivity of the researcher. Data collection methods used for quantitative and data analysis followed are consistent and easily repeatable, thereby generating research outcome with high reliability and validity (*Wang et al., 2017*). Disadvantages of the quantitative method are taken place due to certain weaknesses of the data so collected such as different numbers (digits) have different properties, quality of data is not provable, data overload would take place creating too complexity, and it generates data analysis scientific and technical though it may create the discussion subtle.

Advantages of qualitative data analysis are rich and detailed data available for analysis so that data and analysis are 'grounded.' Further, alternative analysis and explanation can be applied based on the soundness of the researcher and qualitative data analysis ensure that tolerance of ambiguity and contradictions in each social encounter (*Gagliardi et al.,2017*). Qualitative data analysis has its disadvantages due to inherent qualities such as it is difficult to generalize since there are a few instances or a few sources of data available, data analysis takes a longer period as it requires to adjust data with appropriate coding system, it lacks the objectivity of the

data, thereby, researcher's subjectivity plays a substantial role in the creation and analysis of data, and origin of data is usually away from the analysis so that it becomes suspicious and twisting.

Both qualitative and quantitative research approaches have their merits and shortcoming. As the introduction of IT in the public sector is in its full momentum, the study of technology adoption is timely and justified. As there are advantages and disadvantages for qualitative and quantitative methods, I am of the view that we must pay high attention at all stages of the research process, namely; proposal writing including research design and strategy, data collection, data analysis, interpretation, and report writing. When we pay the highest attention to each step with sufficient knowledge and skills, it is possible that we can obtain the advantages of each method while disadvantages can be minimized.

The relation between research area and scientific traditions and societal implications

The research into computer and system sciences gaining its momentum in all spheres today, from natural science domain to social science and from the positivistic approach to interpretivism. At present, whether research is conducted in a developed country or an emerging economy or a less-developed country, is not that significant but how research is conducted using fundamentals of research methodology is worthy of attention. Therefore, it is extremely important to pay the highest attention to the scientific traditions, and societal implications of each research conducted any part of the world. As highlighted by well-known researchers and authority in the specific discipline it is known that the knowledge is power, and which knowledge is appropriate is a phenomenon to be investigated. Accordingly, it has been substantially proven that the knowledge arises from scientific research or investigation is timely and well accepted, especially in a dynamic world of work and in learning organizations. Thereby, it

suggests that updated knowledge in the field of concentration is generated through continuous research and investigation.

This systemic review included both quantitative and qualitative research while some of them are based on a mixed approach. The analysis of the articles indicates how important it is to introduce different theoretical concepts, models, systems, and research methodologies to study urban planning, especially with reference to smart, sustainable communities. The studies conducted in different parts of the world show how effective and important they are to improve the quality of life, economic and societal development, lowering urban problems, especially urban housing and environment, etc. As highlighted during this systemic review process, the proposed research is based on the social science domain, and it is basically an interdisciplinary perspective. Therefore, it combines different fields of investigation such as urban planning, sociology, politics in the form of public participation, environmental science and management, etc.

Conclusion

The results and conclusions of the selected research articles once again proved that they are basically pragmatic and empirical. The proposed research will also be grounded with this approach due to its nature of the subject areas. However, the probable limitations will affect the research outcome; for instance, Sri Lanka has changed government policies with respect to urban and regional planning so that it would affect policy formulation negatively. Further, Sri Lanka lacks the application of public participation in designing and implementing 'policies and procedures' to solve important socio-economic issues in general. This situation might create incompatible expectations and objectives from both partners of the research, namely; the researcher and the participant. Overall, the systematic review of research articles of this nature has improved the confidence and interest into a systematic

investigation of related and partly related research articles in diverse sources available.

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