HOW DOES IT CHANGE AFTER ONE YEAR? A COMPARISON OF THE LANDSCAPE ARCHITECTURE FOUNDATION'S PUBLISHED CASE STUDIES IN 2011 AND 2012/2013

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1 ABSTRACT

Since 2011, Landscape Architecture Foundation (LAF) has started to support a Case Study Investigation (CSI) program to systematically quantify performance of built landscape projects in the three environmental, economic, and social aspects. The goal of CSI is to test whether performance of landscape solutions fulfill designers' intentions and contribute toward achievement of sustainability. So far, about 76 cases are published including 39 cases from 2011 CSI program and 37 cases from 2012/2013 CSI programs. After publishing the 39 case studies in 2011, LAF realized that most cases have environmental benefits well documented, but fail to thoroughly quantify economic and social benefits. Therefore, in its 2012 and 2013 CSI programs, LAF requires research teams to particularly document economic and social benefits. Each case study should report a minimum of five performance benefits and there should be at least one of each type – environmental, economic, and social.

The purpose of this study is to examine whether this requirement transformed benefit composition in the 2012/2013 CSI case studies and to discuss how to improve the future CSI programs. In this study we compared the average total, economic, and social benefits of 2011 and 2012/2013 case studies. We also used a performance benefit composition scale to illustrate the relative ratio of each type of benefits. In addition, we compared the project type, size, location, and completion data of the 2011 and 2012/2013 cases, and also explored the influence of completion date on the benefit composition. The result shows that, in 2012/2013 cases studies, the average number of social benefits increased significantly, and the average number of economic benefits increased just slightly. More rural projects are included. The number of projects in different size categories is more balanced. As for the completion date, the 2011 and 2012/2013 cases are similar, and it seems to have no influence on benefit composition.

1.1 Keywords

landscape performance, composition, economic, social

2 INTRODUCTION

Landscape performance is initiated by Landscape Architecture Foundation in 2010. It is defined as "*The measure of efficiency with which landscape solutions fulfill their intended purpose and contribute toward achieving sustainability*" (LAF, 2012). Landscape performance attempts to systematically quantify performance of built landscape projects in the three environmental, economic and social aspects. Its significance is that it collects evidence, informs decision making, and clarifies landscape architects' contribution toward sustainability.

Since being put forward, sustainable development has been defined in various ways. The most popular definition is *"design, construction, operation, and maintenance practices that meet the needs of the present without compromising the ability of future generations to meet their own needs"* (WCED, 1987), which emphasizes balancing the three environmental, economic and equity concerns of current and future generation (WCED, 1987; Campbell, 1996). Landscape performance's theoretical framework is built upon the sustainability triad: environment, economy and society (Li et al., 2013). It includes two levels of meanings: first, it examines whether applied landscape solutions create benefits that were envisioned, and second it tests whether the interrelationships between environmental, economic and social benefits are converging and contribute toward sustainability (Luo and Li, 2014) (Figure 1).

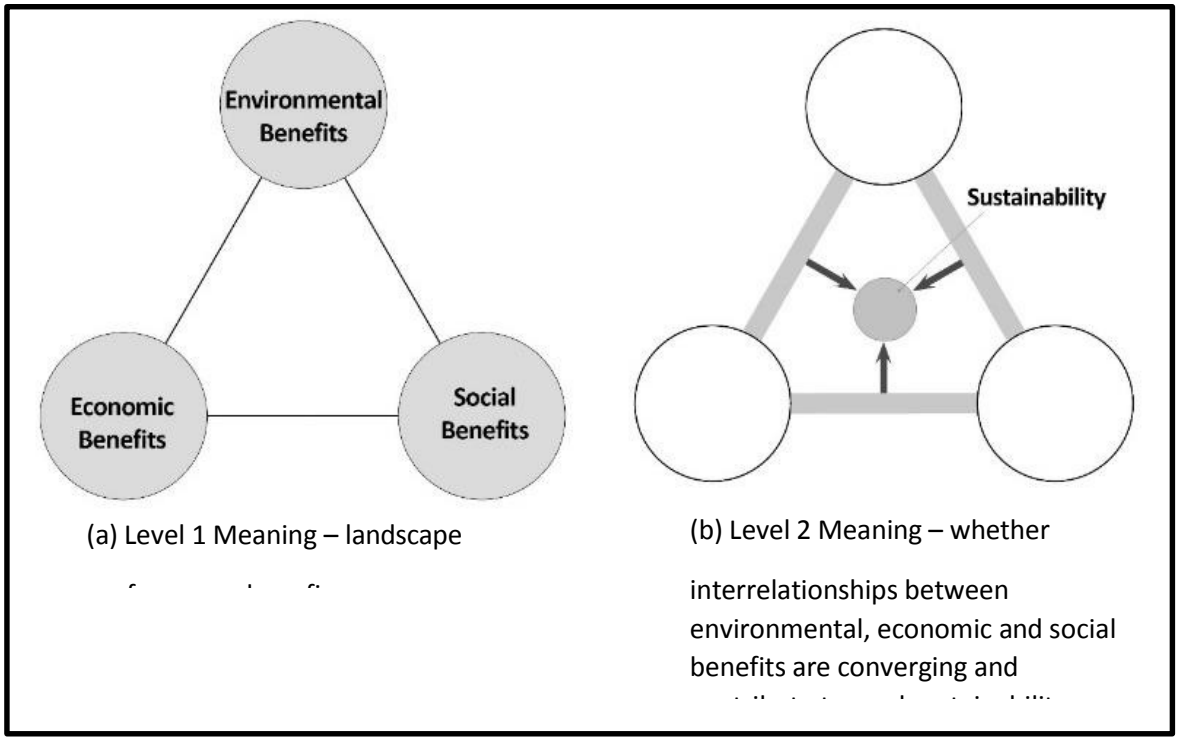

Figure 1. Meanings of Landscape Performance. (Source: Luo and Li, 2014)

Since 2011, LAF has been supporting a Case Study Investigation (CSI) program. CSI is a collaboration of faculty, student and leading practitioners to document performance of high-performing landscapes (LAF, 2012). By now, more than 29 research teams and more than 52 leading landscape architecture firms have participated in the CSI programs (Luo and Li, 2014). As of January, 2014, 76 cases are published, including 39 cases from the 2011 CSI program and 37 cases from the 2012/2013 programs.

Last year, we analyzed the 39 landscape performance case studies published by LAF in its 2011 CSI program. Below is a summary of our findings:

1) The composition of the CSI projects is unbalanced in terms of the project type, location, and size.
   a. Some project types such as park and natural preserve have 19 and 7 cases, respectively; some other project types such as multi-family residence and office have only 1 and 2 cases, respectively.
   b. As for location, only seven of the 39 cases are located in rural areas and the rest 32 cases are located in urban areas.
   c. In terms of size, 30 of 39 cases range from 1-100 acres, and there are three cases in each of the other three categories: 1) less than 1 acre; 2) 100-100 acres; and 3) larger than 1000 acres categories.

2) Most cases have more environmental benefits quantified than economic and social benefits. Among the 39 cases, nine have no economic benefits documented, and eight have no social benefits documented.

We attributed this finding to that landscape architects are more familiar with knowledge and techniques regarding the environmental aspect of sustainability. They are not trained to quantify economic and social benefits of landscape projects and do not have sufficient knowledge and skills to collect data and calculate economic performance. Also, it is possible that collecting economic and social data within limited time is challenging. In addition, as Haines-Young (2002) argues sustainability is not a state but a changing process, so some benefits might not appear until a later time. The unbalanced benefit composition also caught LAF's attention. In the 2012/2013 CSI programs, LAF required research teams to particularly document economic and social

benefits. Each case study should report a minimum of five performance benefits and there should be at least one of each type – environmental, economic and social. The purpose of this study is to examine whether these requirements transformed benefit composition in the 2012/2013 CSI studies and to discuss how to improve the future CSI programs.

3 METHODS

In order to examine whether the 2012/2013 cases are improved in terms of project composition and benefit composition, we conducted an assumption based case study. The samples we used are LAF's 39 case studies published in 2011 and 37 case studies published in 2012/2013. To conduct this case study, we made three assumptions: 1) all research teams endeavored to collect data and document landscape performance benefits; 2) the data source and research methods the research teams adopted are reliable; and 3) the basic information of case studies is accurate.

Last year, we created a Landscape Performance Benefit Composition Scale to study each case study's benefit composition (Figure 2). In this scale, the total benefit number of a project is considered 100%, and the relative ratio of each of the three environmental, economic and social categories is calculated using the following equation (Luo and Li, 2014):

$$R = \frac{\text{(number of benefits)}}{\text{(total number of benefits)}} \times 100$$

where R is the relative ratio of each type of benefits. As shown in Figure 2, the top corner of the scale represents projects that have more economic benefits documented, the left bottom corner represents more environmental benefits, the right bottom corner represents more social benefits, and the triangle in the center represents projects that have similar number of environmental, economic, and social benefits. Admittedly, number of benefits associated with relative ratio of the three aspects cannot fully address the balance of sustainability. Some other factors such as weight, and significance of each benefit could make a substantial difference. However, we feel this scale could be used to demonstrate the trend of landscape performance benefit quantification.

We used the same scale to compare the benefit composition of the 2012/2013 and 2011 case studies. Then we calculated and compare 2012/2013 and 2011 case studies in terms of the average number of total, economic, and social benefits. We also classified the 37 cases (2012/2013) by project type, size, location (rural/urban) and time of completion to see how the project composition is different from the last year. Lastly, we sorted the total 76 cases (2011 and 2012/2013) according to projects' completion date to examine whether projects completed earlier create more total, economic, and social benefits.

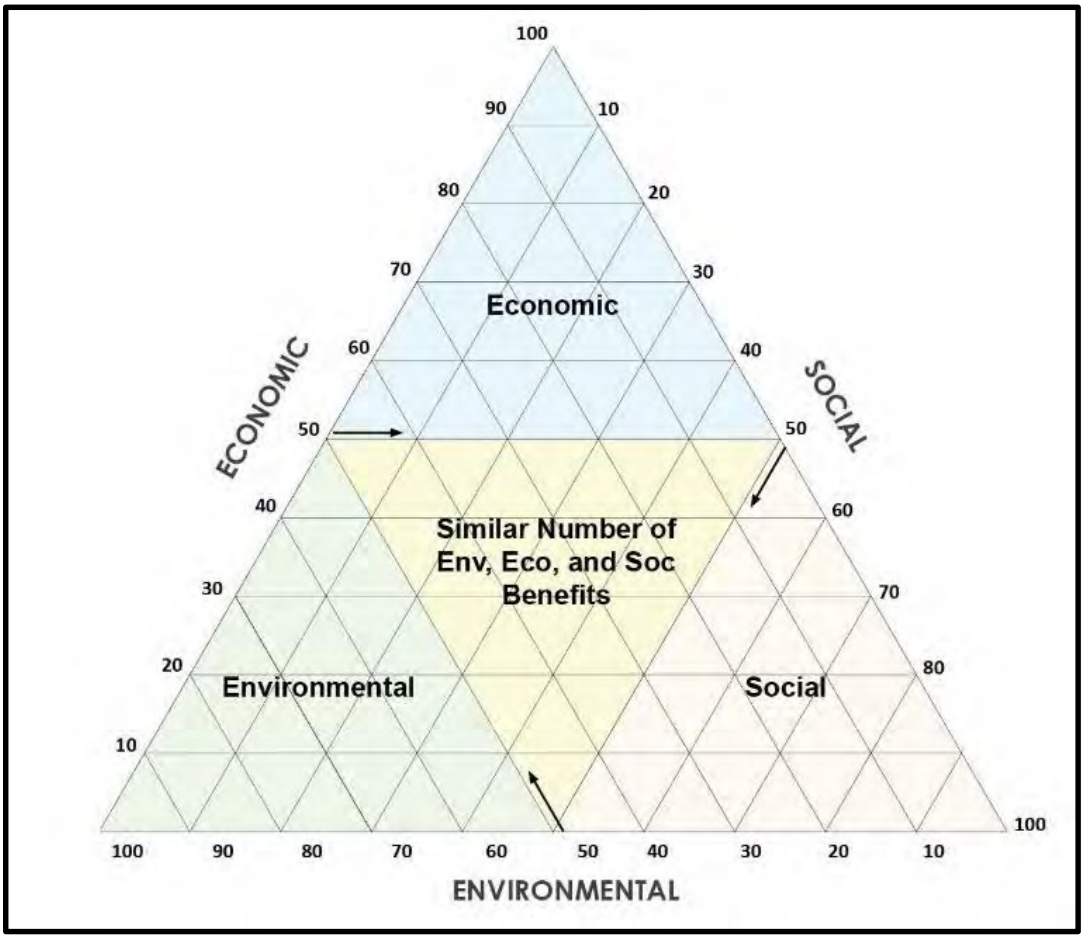

Figure 2. Landscape Performance Benefit Composition Scale. (Source: Luo and Li, 2014)

4 RESULTS AND DISCUSSION

4.1 Project Benefit Composition

The result of comparing project benefit composition of 2011 and 2012/2013 cases is shown in Figure 3. Figure 3a represents 2011 cases, and Figure 3b represents 2012/2013 cases. In 2011, 25 cases have more environmental benefits documented, two cases have more economic benefits, two cases have more social benefits, and 10 cases have similar number of environmental, economic and social benefits. Nine cases are located on the environmental bar, representing no economic benefits, and eight cases are located on the economic bar, representing no social benefits. In 2012/2013, majority of cases (22 of 37) are located in the central triangle in the scale, meaning that they have similar number of environmental, economic and social benefits, 11 cases have more environmental benefits, one has more economic benefits, and three have more social benefits. No case is located on the economic bar, meaning that all projects have at least one social benefit, while there are still seven cases located on the environmental bar, representing that they have no economic benefits documented.

We also calculate the average number of total, economic, and social benefits. In 2011, the 39 cases' average number of total benefits is seven, the average number of economic benefits is 1.6, and the average number of social benefits is 1.8. In 2012/2013, the 37 cases' average number of total benefits is 8, the average number of economic benefits is 1.9, and the average number of social benefits is 2.4.

Compared to 2011 cases, the average number of total benefits in 2012/2013 does not increase greatly (7 to 8), while benefit composition of 2012/2013 cases are more balanced (move to the center triangle). Social benefits documentation is significantly improved.

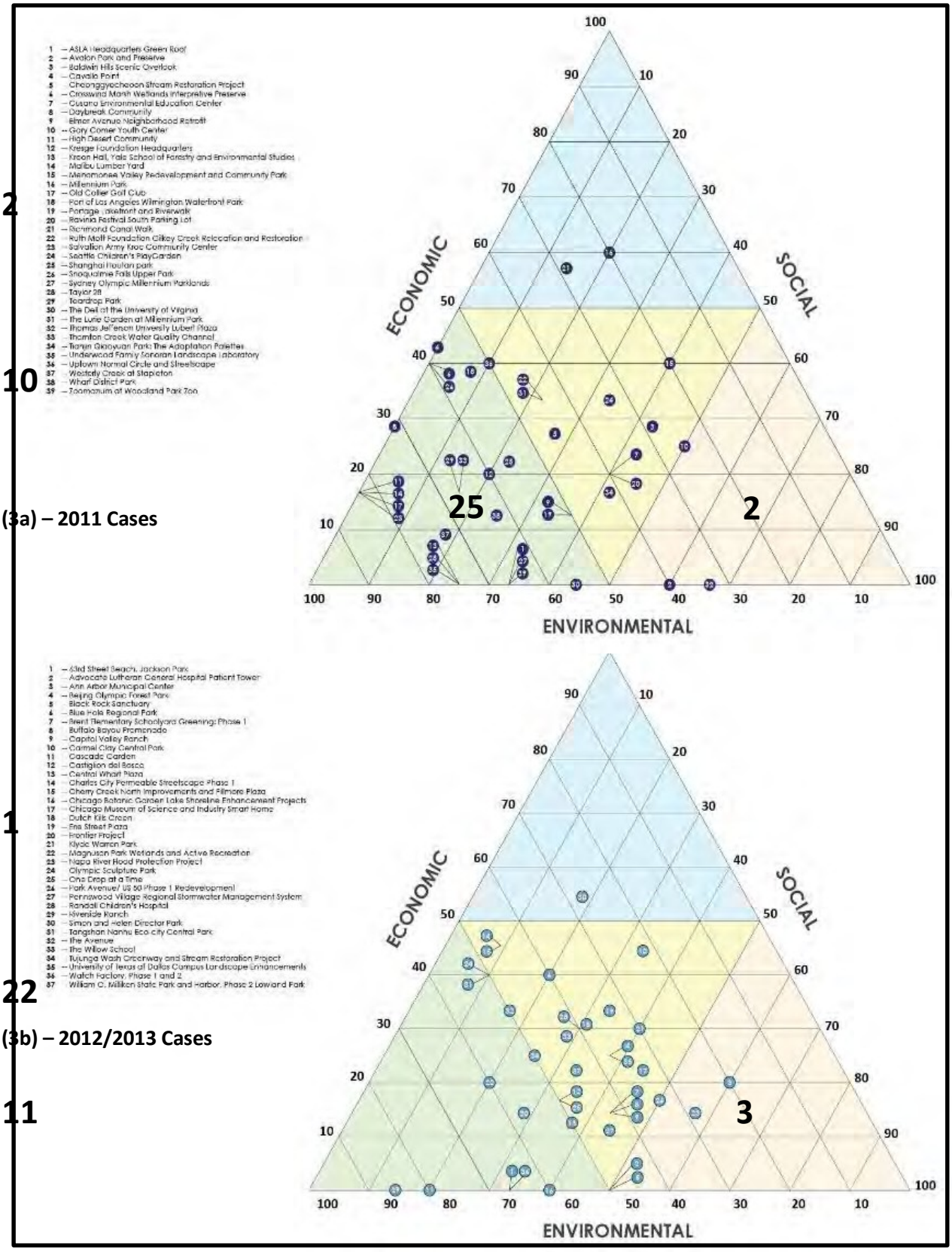

Figure 3. Comparison of Project Benefits Composition Between 2011 and 2012/2013 Cases

Social benefits that were reported mostly include recreational value, educational value, and increase of satisfaction and life quality. There is also an increase in view/scene quality improvement, crime prevention, and historical site preservation. As for the average number of economic benefits, the increase is not as remarkable as social benefits. Cost saving/avoiding is the mostly reported economic benefit. The reasons that contribute to cost saving vary largely from project to project, such as water saving, materials recycling, energy saving, and volunteering. Since there are still seven projects that reported no economic benefit, other assistance seem to be necessary to help strengthen economic benefit documentation. We would like to suggest including a research assistant or a research fellow from relevant majors (land development, real estate, and economics) for future CSI programs.

Table 1. Project type of 2011 and 2012/2013 CSI case studies

Project Type	2011	2012/2013	Total
Conference / Retreat Center	1		1
Golf course	1		1
Industrial park	1		1
Sports facility, other	1		1
Civic/Government Facility		1	1
Resort/Hotel		1	1
Working Landscape		1	1
Recreational trail		1	1
Community	2		2
Multi-family residence	1	1	2
Playground	1	1	2
Urban agriculture	2		2
Healthcare facility	1	2	3
Office	2	1	3
Other	1	3	4
Retail	2	2	4
Transportation	2	2	4
Single Family Residence		4	4
Garden / Arboretum	4	2	6
Waterfront redevelopment	2	4	6
School / University	4	3	7
Stream restoration	5	2	7
Wetland creation/restoration		7	7
Streetscape	3	7	10
Nature preserve	7	5	12
Stormwater management facility	8	4	12
Courtyard / Plaza	6	11	17
Park	19	14	33

Table 2. Comparison of portion of size categories between 2011 and 2012/2013 cases

	Area ≤ 1 acre	1-10 acres	10-100 acres	100-1000 acres	Area ≥ 1000 acres
2011	3	16	14	3	3
2012/2013	8	11	9	5	4

4.2 Project Type

The comparison of project types between the 2011 and 2012/2013 case studies is presented in the table below. In 2012/2013, six new project types are reported, including civic/government facility, wetland creation/restoration, single-family residence, resort/hotel, working landscape, and recreational trail. In both years (2011 and 2012/2013), most project types studied are park, stormwater management facility, and natural preserve. Cases in courtyard / plaza, streetscape, and wetland creation/restoration increase significantly, while cases in many other project types, such as conference, industrial park, resort, playground and multifamily remain few. Certainly, some of these project types are less popular; however, community, multi-family residence and playground are quite common. Including more cases from these project types could help with conducting comparative studies between cases of the same type, and better contribute to future landscape designs of these popular project types.

4.3 Project Size

The result of project size comparison is shown in Table 2. The graphs show the portion of each of the five size categories of the projects in 2011 and 2012/2013: 1) less than 1 acre; 2) 1-10 acres; 3) 10-100 acres; 4) 100-1000 acres and 5) larger than 1000 acres. The graphs in the upper level represent the 2011 case studies, and graphs in the lower level represent the 2012/2013 case studies. In 2011, most cases are in “1-10 acres” and “10-100 acres”, which limits the generalizability of cases studies in the other three size categories. In 2012/2013, the cases are more evenly distributed across three categories. This change helps increase the diversity of the CSI programs and improves the reliability of the Landscape Performance Series.

4.4 Project Location

We classified the 2011 and 2012/213 cases into rural and urban groups based on population density of the places where the projects are located. The result is shown in Figure 4. In 2011, seven of 39 cases are located in rural areas, accounting for 18% or all cases. In 2012/2013 case studies, nine of 37 cases are located in rural areas, accounting for 24% of all cases. The result indicates that the rural projects increase slightly in comparison to 2011, but majority of the projects are still located in urban areas.

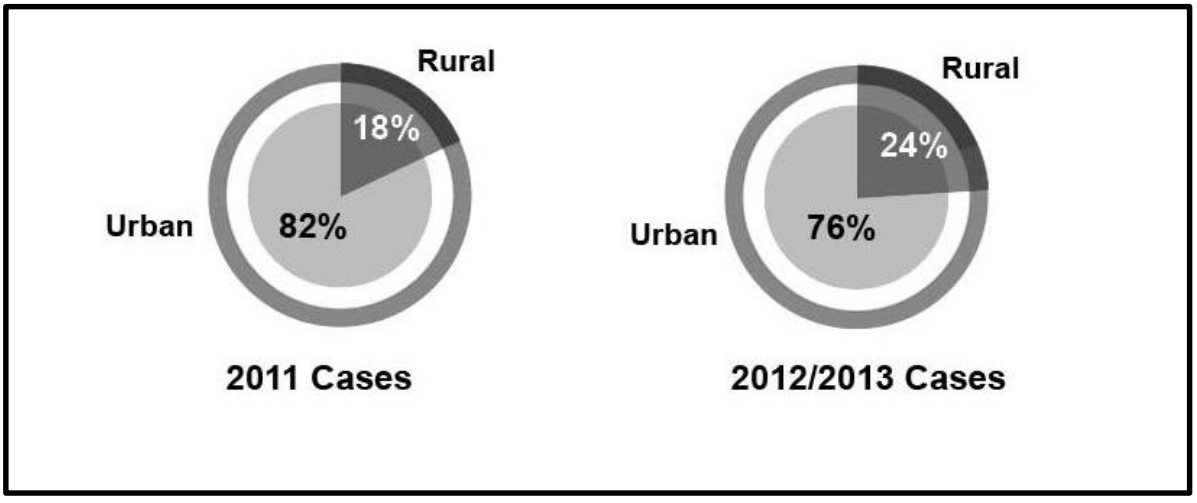

Figure 4. Comparison of Portion of Location Between 2011 and 2012/2013 Cases

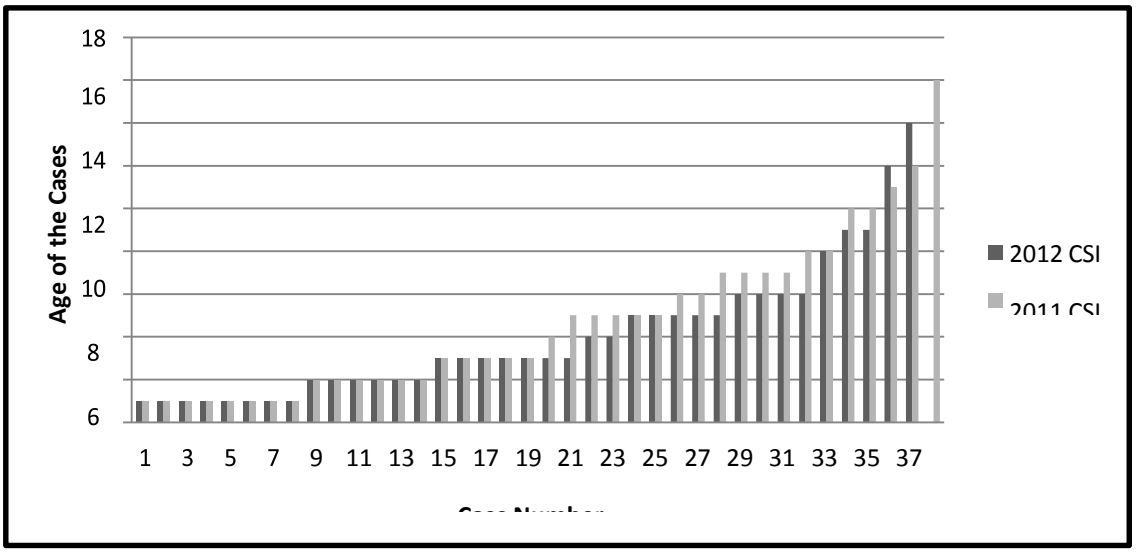

Figure 5. Comparison of Ages of Cases Between 2011 and 2012/2013

4.5 Completion Date

The result of comparing the completion dates of the 2011 and 2012/2013 CSI cases is shown in the Figure 5. Overall, there is no significant difference between 2012/2013 cases and 2011 cases. The majority of cases in both years were completed in less than 5 years ago. Among the 2011 cases, 25 were finished within 5 years, 10 were finished within 6-10 years, and 3 were finished within 10-20 years. Among the 2012/2013 cases, 28 were finished within 5 years, 7 were finished within 6-10 years, and 2 were finished within 10-20 years. Landscape changes and develops overtime. It will be an improvement to CSI if time can be taken into consideration. One suggestion is to select projects that were completed across different time periods, especially projects that are of similar type, size, and social context, such that we can comparatively study similar projects over time.

4.6 Influence of Completion Date on Total Benefit Number

As mentioned before, landscape is a changing process, and some benefits might take time to reveal. For example, the soil improvement by native species, property value increase by recreational trail, and residents' satisfaction increase due to improved stormwater management might take years to achieve. Hence, it is possible that a project's completion date would influence the total number of measurable benefits. Given that, we studied the influence of time of completion on the total benefit number. The result is shown in Figure 6. The x axis represents the 76 (2011 and 2012/2013) cases' age when the landscape performance quantification was conducted. The y-axis represents total number of measured benefits documented. The figure shows that the total numbers of benefits do not differ significantly throughout the different ages. In other words, the projects that were finished earlier do not generate more measurable benefits in comparison to the newly finished projects. However, it needs to be noted that for projects that are built earlier, it is more difficult to collect baseline data. Moreover, LAF's requirement in 2012 and 2013 is at least five benefits for each project. Under the tight timeframe and limited budget, research teams might choose to meet the minimum requirement.

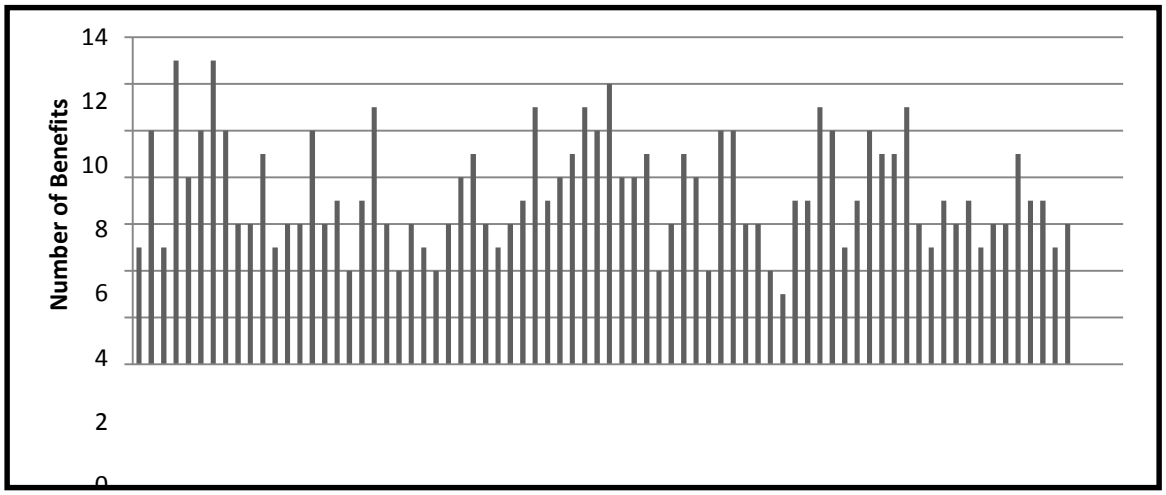

Figure 6. Influence of Completion Date on Number of Benefits

4.7 Influence of Completion Date on Benefit Composition

In addition to study the influence of projects' age on total number of benefits, we also studied its influence on benefit composition, and the result is shown in Figure 7. Projects built in less than 10 years in Figure 7a and Figure 7b are likely to assemble at the central area of the triangle, while projects in Figure 7c are located close to the environmental bar and economic bar. It suggests that projects that were built within 10 years probably have similar numbers of environmental, economic and social benefits documented. However, projects that were built earlier create either less economic benefits or less social benefits. It needs to note that, this finding is subject to further confirmation since there are only 7 cases that are older than 10 years, limiting the generalizability of the result. We would suggest including older projects in future CSI programs.

5 CONCLUSION

This paper compares LAF's case studies in the 2012/2013 CSI programs and the 2011 CSI program on the average number of benefits, benefit composition, project type, size, location, and completion date. It also explores the influence of completion date on the number of benefits and benefits composition. The results suggest that LAF's requirement of particularly documenting economic and social benefits significantly increases number of social benefits reported, and slightly increases number of economic benefits. The average number of total benefits also increased slightly in 2012/2013 cases. There are six new project types in the CSI program; however, most cases are still from park. In 2012/2013 cases, rural projects increased from 18% to 24%; however, most cases are still located in urban areas. The size composition in 2012/2013 is more balanced than that in 2011. Completion date of projects does not have a significant influence on the number of total benefits; older projects do not generate more benefits than newly constructed projects. In addition, older projects are likely to create less economic and social benefits. However, this finding is subject to further confirmation due to a small case number.

In conclusion, the CSI program is improved in 2012 and 2013 in terms of social benefits documentation and project diversity. In order to further increase the diversity and complement the cross-sectional quantification methods, we suggest including more cases from community, multi-family residence, and playground, and including more projects that were finished in different periods of time, especially earlier times.

It is worth noting that, this study is based upon the assumptions that research teams endeavor to exhaust all quantifiable performance benefits, and the methods and results of all CSI case studies are credible. However, due to the tight time frame, limited budget, and unavailability of many data, many benefits might not be quantified. Additionally, since the methods used in CSI differ largely across the case studies, the reliability and validity of these methods and results is not guaranteed. These factors will undermine the results of this study. Moreover, the case number in this study is not big (76), which might limit the generalizability of the study results.

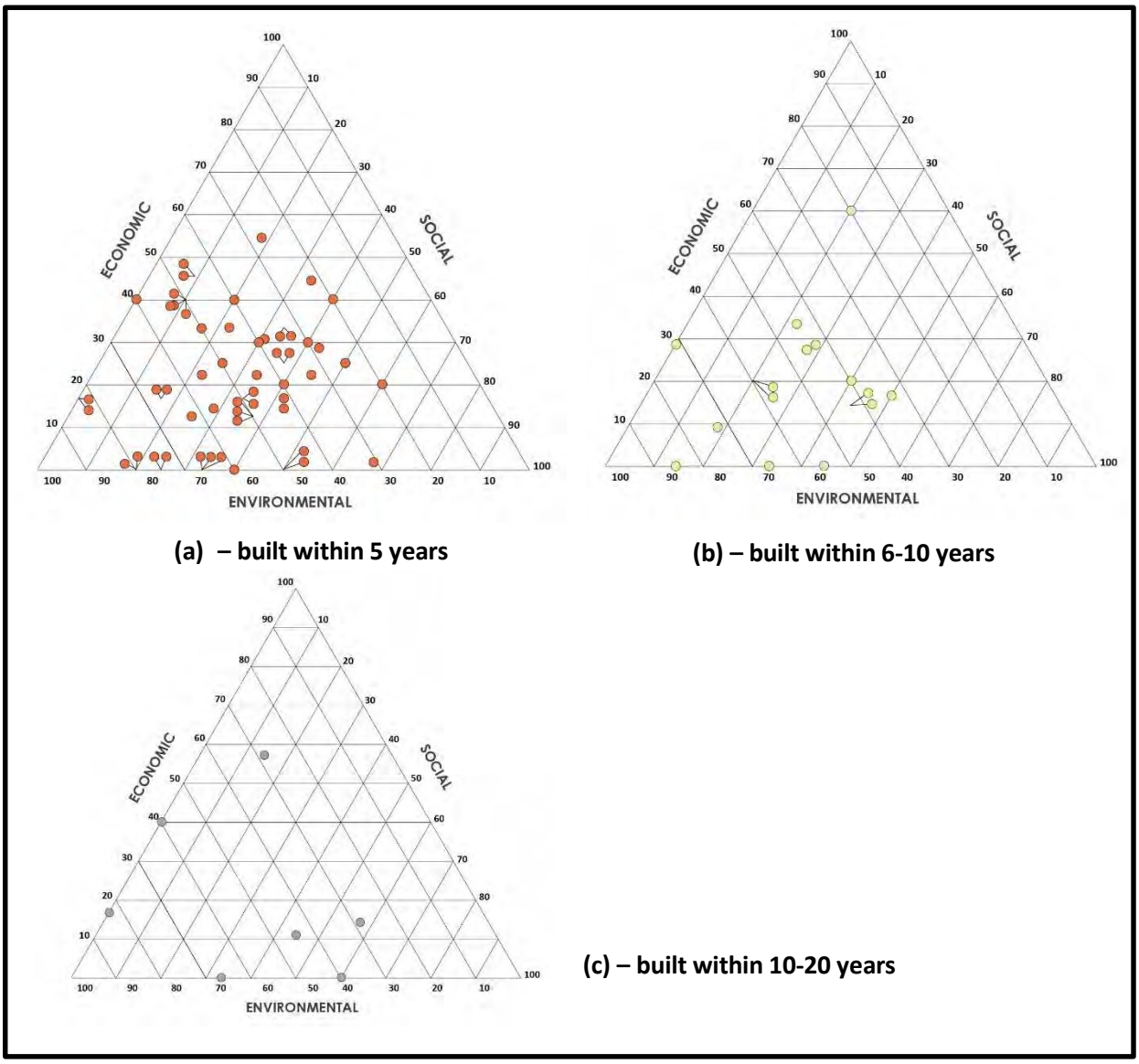

Figure 7. Influence of Projects' Age on Benefit Composition

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