For low-carbon urban development using greenery

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1. Introduction

The Low Carbon City Act was enacted in December 2012. With this law, activities have been implemented to develop low-carbon urban cities based on three fields of (i) an urban structure and transportation field, (ii) energy field, and (iii) green field. Among these fields, the green field is expected to have direct effects of fixing and absorbing CO_2 through urban greening and indirect effects of reducing carbon through energy conservation effect of buildings near areas where the thermal environment is improved through greening. Yet, it is difficult to identify the quantity of greens. Thus, the current studies are only estimating the converted amount of direct CO_2 fixation and absorption by plants in parks where conditions of greens such as the number of plants are being controlled.

Therefore, the National Institute for Land and Infrastructure Management (NILIM) started a three-year plan of a study[1] concerning the development of methods to evaluate low-carbon urban development by improving the urban thermal environment using greens from FY 2015 to 2017.

2. Detail of the study

Figure 1 describes the structure and content of the study.

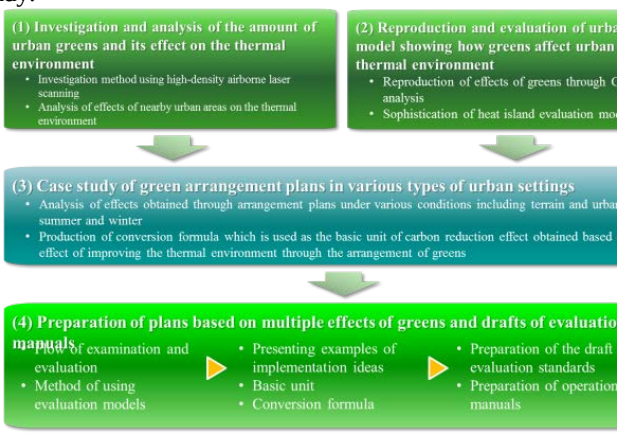

Figure 1. Structure of the study

Step (1) of the study first investigates three-dimensional distribution of greens using airborne LiDAR to identify conditions of urban greens, which are difficult to capture from the ground (Fig. 2). Effects of greens on the thermal environment of nearby buildings are investigated in this step. In step (2), flows of heat and wind are recreated and evaluated by individual blocks using the method of computational fluid dynamics (CFD) that simulates them using numerical computation. A method to quantitatively convert the effect of carbon reduction is established in this step. In step (3), urban thermal environment evaluation tool[2] of which functions are improved based on the analytical outcomes in (1) and examinations in (2) is used to find a method to effectively arrange greens to suit regional conditions. In step (4), the draft of a manual for local governments is created based on the examination in step (3).

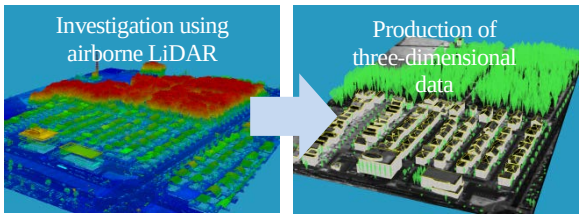

Figure 2. Investigation of the three-dimensional distribution of greens

3. Conclusion

Future activities of this study include the following: development of methods to quantitatively convert indirect carbon reduction effect of green; preparation of a manual for proper arrangement of greens to reduce carbon in cities; and technically support local governments to effectively and efficiently create low-carbon cities using greens with these tools.

☞Details

1) Website of NILIM Urban Planning Department Urban Planning Division
http://www.nilim.go.jp/lab/jbg/green/green.html
2) Urban thermal environment effort evaluation tool
http://www.nilim.go.jp/lab/icg/hyouka-tool.htm