

オリンピック・パラリンピック暑熱対策のための 可搬式緑化技術の普及実装に関する研究

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研究・活動の背景と目的

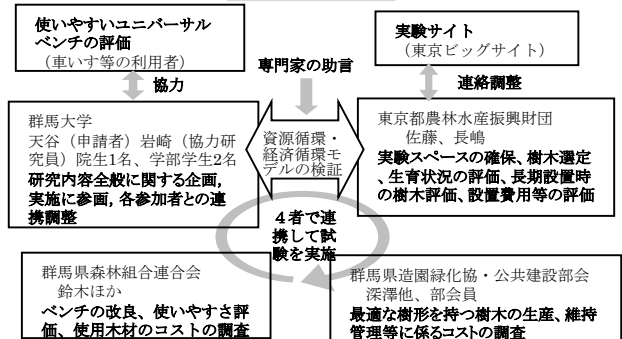
【背景】

- オリンピック・パラリンピック期間の熱中症対策
- 屋外低温空間(クールスポット)の形成
- 郊外の森林資源の都市部への活用と経済循環
- 造園業等の伝統産業の活性化

【目的】

- 可搬式樹木緑化ベンチによる低温空間の形成の効果を検証
⇒ 温熱環境測定、温熱感評価
- 社会へ普及させるためのニーズ調査
- 普及のためのコストの見積もりや仕組みづくり
- 車椅子用ベンチの評価

実施体制



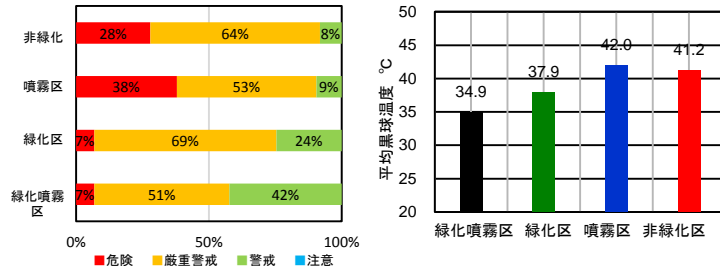
内容と成果

温熱環境測定結果

実施期間: 2016/6/30 ~ 2016/9/23

実施場所: 東京国際展示場東展示場駐車場

「緑化+噴霧」「緑化のみ」「噴霧のみ」「緑化・噴霧なし」の4区域で、気温・湿度・日照量・黒球温度(≒体感温度)・WBGT(熱中症指数)を測定



緑化と噴霧を行った区域が最も黒球温度を下げられ、熱中症危険リスク低減可

車椅子利用者へのヒアリングと設計へのフィードバック

車椅子利用者に実際にベンチ内に入ってもらい動きやすさや、会話のしやすさをヒアリング、改良点の抽出

- 概ね現在のデザインでも問題なし
- 車椅子の回転スペースは十分
- 車椅子利用者と健常者ともに話やすい
- 改善したほうが良い点
 - ① 車椅子回転時にベンチの脚につま先が当たりそう
 - ② 車椅子2台で使用する場合ベンチ間隔が広い方が良い
⇒ 改良版製作時に反映



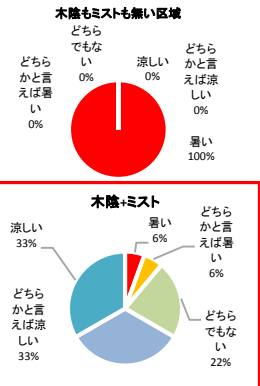
温熱感・快適性評価(アンケート調査)

日時: 2016年9月9日 11:30~12:30

場所: 東京国際展示場東棟駐車場

平均気温=32°C、平均湿度=52%

平均風速=2.7m/s、アンケート協力者18名



木陰+ミスト(緑陰噴霧区)が最も涼しいと感じている。

造園業者へのヒアリング

庭造り用の樹木が減少し
公共事業用の樹木が増加

枝張りが小さく、樹高が高いものが主に流通

【調査結果】緑化ベンチに適した樹木は圃場の10~15%、緑化ベンチに適した樹木はほとんど市場に出荷されない、3ヶ月程度の植付には十分耐えられる、販売価格は5万円程度が必要、設置費用運送費を考えると1時間圏内、...



まとめ

本技術を社会へ普及させるためのニーズ調査、コストの見積もり、さらには、普及のための仕組みづくりを行うための基礎資料を、森林組合、造園業者、利用者など様々な視点から調査することができた。特に、車椅子メーカーや車椅子利用者の協力を得て、ユニバーサルベンチの評価も行い、本技術の有効性を確認することができた。

Research into Implementing and Spreading Portable Greening Technology as Measures against the Fierce Heat during the Olympic and Paralympic Games

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Background and Objectives of Research/Activities

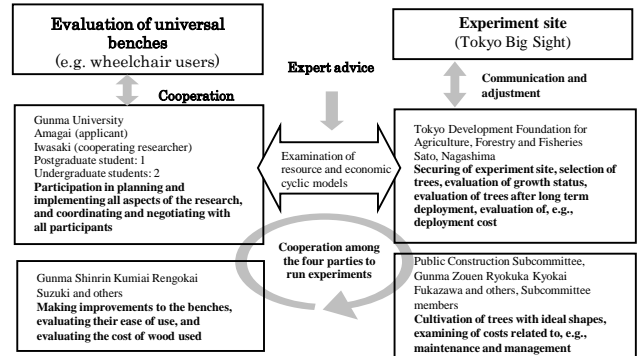
[Background]

- Measures against fierce heat during the Olympic and Paralympic Games
- Establishment of greenery technology for outdoor cool spots
- Making use of suburban forest resources in urban areas, and economic circulation
- Revitalization of traditional industries such as gardening companies

[Objectives]

- Investigation of the effectiveness of portable tree greenery technology for establishment of cool spots → Measurement of thermal environment data and evaluation of the thermal sensation and comfortability by human
- Survey of requirements to spread the technology in real society
- Evaluation of costs, and establishment of popularizing system
- Development universal benches for wheelchair users

Research/Activity Implementation System



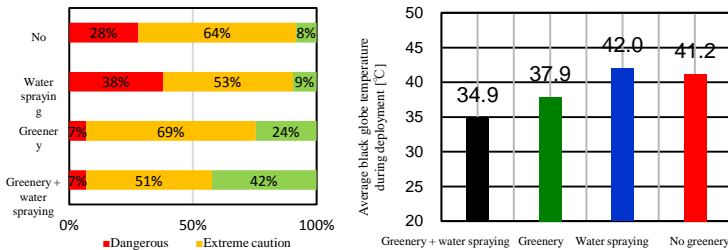
Details and Outcomes

Results of Thermal Environment Measurements

Deployment duration: June 30 – September 30, 2016

Location: East Halls Parking Area, Tokyo Big Sight

The temperature, humidity, amount of sunshine, black globe temperature (≒ effective temperature), and WBGT (Wet-Bulb Globe Temperature) will be measured in the four zones of “greenery + water spraying,” “greenery only,” “water spraying only,” and “no greenery or water spraying.”



The black globe temperature in “greenery and water spraying zone” was lowest. And the risk of heatstroke became low.

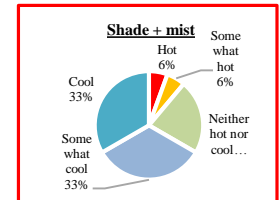
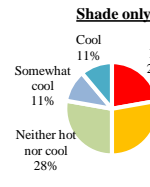
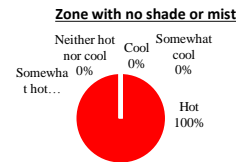
Evaluation of Effective Temperature and Comfort (Questionnaire Survey)

Time and date: 11:30 A.M. – 12:30 P.M. September 9, 2016

Place: East Parking Area, Tokyo Big Sight

Average temperature = 32.2°C, Average humidity = 52%

Average wind speed = 2.7 m/s, Questionnaire respondents: 18



It was confirmed that “shade + mist zone” (greenery + water spraying zone) was the coolest zone.

Interview with wheelchair users and feedback into the design

Interview with wheelchair users by having them move into the bench area and review the ease of movement and ease of conversation, and identification of the positive points.



- Generally, there are no problems with the current design.
- There is adequate rotation space for the wheelchair.
- It is easy to converse for both wheelchair users and regular users.
- Points to be improved on:
 - (1) When turning the wheelchair, the users’ toes feel as if they may hit the legs of the bench.
 - (2) It is better to widen the space between the benches when it is used by two wheelchairs.
 - ⇒ Reflect into design when producing the improved version

Interview with landscape contractors

Decrease in the number of trees for building gardens; increase in the number of trees for public projects

Circulation of mainly tall trees with small branches

[Results of study] Trees that are suitable for greening benches make up 10 - 15% of the cultivated land. Most trees suitable for greening benches are not shipped out to the market, and there is a need for trees that can withstand planting for about three months with a retail price of about 50,000 yen; within a range of one hour when taking into consideration set-up and transportation costs...



Examples of suitable trees

Future Plans

The needs survey for popularizing this technology in society, cost estimates, as well as basic materials needed for establishing a framework for popularizing the technology were successfully studied from the various perspectives of forestry associations, landscape contractors, and users. In particular, a universal bench assessment was also conducted with cooperation from wheelchair manufacturers and wheelchair users, enabling the verification of the validity of this technology.