

Benchmarking the Implementation of Urban Tree Protection Legislative Provisions (TPLPs) for Construction Projects

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Abstract

Urban trees are highly susceptible to damage during construction activities, making effective urban Tree Protection Legislative Provisions (TPLPs) crucial for safeguarding environmental, social, and economic benefits in cities. In Malaysia, TPLPs embedded in the Town and Country Planning Act 1976 (Act 172) empower the local planning authorities (LPAs) to enforce requirements for tree protection. However, recurring incidences of unauthorised tree removal indicate shortcomings in implementation. This study benchmarks Malaysia's TPLP implementation practices against those in Australia and the United Kingdom, where more established standards exist for protecting trees on development sites. A deductive thematic analysis of LPA websites and official documents from both countries was conducted to identify success factors, which were then mapped against four components in the existing Malaysian TPLPs implementation framework: Publicity, Protected Tree List, Planning Permission Procedures, and Enforcement Plan. The benchmarking has resulted in fifteen success factors to be incorporated in the original framework, and to be proposed as potential Critical Success Factors (CSFs) that suit the Malaysian context. These CSFs underscore the importance of raising stakeholder awareness, improving access to protected-tree information, strengthening procedural requirements within planning approvals, and reinforcing enforcement mechanisms. The revised framework provides strategic guidance for LPAs to improve governance and practical implementation of Act 172 for construction projects.

1. Introduction

There are countless advantages that trees provide to both the environment and people. Sustaining wildlife, conserving water, and preserving soil are among the ecological services offered by trees. The carbon dioxide absorbed by trees during photosynthesis is converted into oxygen for us to breathe. Trees are planted for their many advantages because they are necessary components of any public area [1, 2]. However, only when these city trees are robust and healthy can they be useful. Urban trees must be shielded from harmful elements throughout their lives, particularly during construction projects, as they can become prone to attack from pests and diseases

and become dangerous when injured or damaged. The International Society of Arboriculture states that root damage, soil compaction, physical harm to the trunk crown and root collar, heat and chemicals, and the removal of supporting trees are the main causes of tree damage during construction.

The most frequent cause of tree damage during construction projects is root damage [3]. During construction, the roots could be cut by trenching and soil excavation. Cutting roots near the trunk would undoubtedly harm the tree and make it more difficult to remain upright during storms. Diseases that impact the health of the tree can easily infect a wounded root system [4]. Tree roots grow and develop best in soil that has 50% pore space for air and water flow. Allowing construction vehicles or placing heavy equipment too close to the tree could compact the soil underneath, and would consequently suffocate the tree roots because compaction lessens the ability of the soil to hold water and oxygen required by the roots to grow. Trees suffer from this root suffocation, which occasionally results in tree death [5, 6].

If construction equipment is allowed near a tree or if structures are erected in the tree's growing area, the tree's trunk, branches, and roots may sustain damage. It is challenging to manoeuvre vehicles and other machinery around and between trees without causing damage to any of the tree parts. According to [7], physical injuries result in permanent scarring, health decline, decay, pests, vulnerability to further damage, and structural issues that necessitate the removal of the tree. The bark and foliage of trees could be easily harmed by the heat from operating machinery and burning construction waste. Fruit drop [8], shoot damage, leaf burn, and, in extreme situations, leaf drop [9] are all signs of heat damage to trees caused by extremely high temperatures. Additionally, mortality from disease and insect attacks could result from the damage [10]. Cement-polluted water runoff from cleaning concrete delivery trucks [11] and spilt diesel fuel and chemicals [12] could seep into the soil, altering its chemistry and ultimately impeding root development and function [13, 14].

Mature trees that grow closely together resemble a community in which they help and look out for one another. If some of the trees were removed, the remaining trees would be left vulnerable to extreme weather conditions like damaging wind gusts and intense heat from the sun. The trees could experience sunscald stress [15] and structural failures as a result of this abrupt exposure to the weather [16]. Therefore, it's critical that construction projects include safeguards against damage to trees.

For decades, the governments around the world have taken action to protect trees in their urban areas by enacting laws that the local planning authorities (LPAs) must follow. This is done to ensure that development activities, such as construction projects, do not negatively impact the trees. According to Nik Adlin et al. [17], these urban tree protection legislative provisions (TPLPs) fall into five categories: *Tree Felling Prohibition*, *Establishment of a Significant Tree Register*, *Designation of a Tree Conservation Area*, *Tree Preservation Order (TPO)*, and *Tree Protection Planning Conditions*. The *Tree Felling Prohibition* allows LPAs to forbid tree-cutting and other tree-damaging operations without their permission. For the next TPLP, LPAs can establish registers of trees that deemed significant to be protected. The third TPLP, *Designation of a Tree Conservation Area*, authorizes LPAs to designate areas under their jurisdiction where the trees within the areas are protected. The TPO refers to an order issued by LPAs to preserve particular trees, groups of tree, or woodlands for the sake of amenity [18]. Finally, the *Tree Protection Planning Conditions* deal with requirements placed on developers by LPAs when they grant planning permission, which include preserving and safeguarding any trees in the areas that will be developed.

In the Malaysian context, the urban TPLPs implementable by the LPAs are *Tree Felling Prohibition*, *Tree Preservation Order (TPO)*, and *Tree Protection Planning Conditions* [18]. These TPLPs are listed in the Town and Country Planning Act 1976, also known as Act 172, hence referred to as TPLP (Act 172). The Act 172, which was amended in 1996 [19] to help LPAs better protect trees in their municipal areas, gives the LPAs the authority to impose tree protection requirements with the approval of planning applications, to make TPOs, and to forbid the felling of trees without authorisation. These tree protection laws ought to be sufficient to stop any unlawful tree cutting or tree damage if they are correctly put into effect and upheld. However, as noted by Nik Adlin et al. [20], there have been instances of large, old trees being chopped down without the permission of the local authorities, which has led to concerns about the effectiveness of the Malaysian TPLP (Act 172). With this in mind, Nik Adlin et al. [20] has proposed a conceptual framework of TPLP (Act 172) implementation for construction projects (Figure 1).

The framework was created by applying inductive thematic analysis approach to the qualitative data sourced from systematic literature review, authoritative documents, and expert interview, primarily focusing on Act 172. The thematic analysis process whereby the data have to be described, and also to be interpreted in the processes of selecting codes and constructing themes [21] has resulted in four key components of the framework: *Publicity*, *Protected Tree List*, *Planning Permission Procedures*, and *Enforcement Plan*, each addressing critical success factors (CSFs) necessary for effective implementation. CSFs mean a number of success factors - identified from many - that an organisation should focus on to ensure the success of its undertakings. Defined as parameters that determine the success or failure of a business unit or organisation, CSF was a concept developed and introduced by D. Ronald Daniel, on behalf of McKinsey & Co. [22]. The concept, refined and popularized by John F. Rockart a decade later, has since been widely applied to guide organizations in developing and implementing strategies and

projects [23]. Regarded as a tool for measuring performance in an organisation to achieve its mission [24], CSF represents the areas that the management must carefully consider to bring about continued good performance.

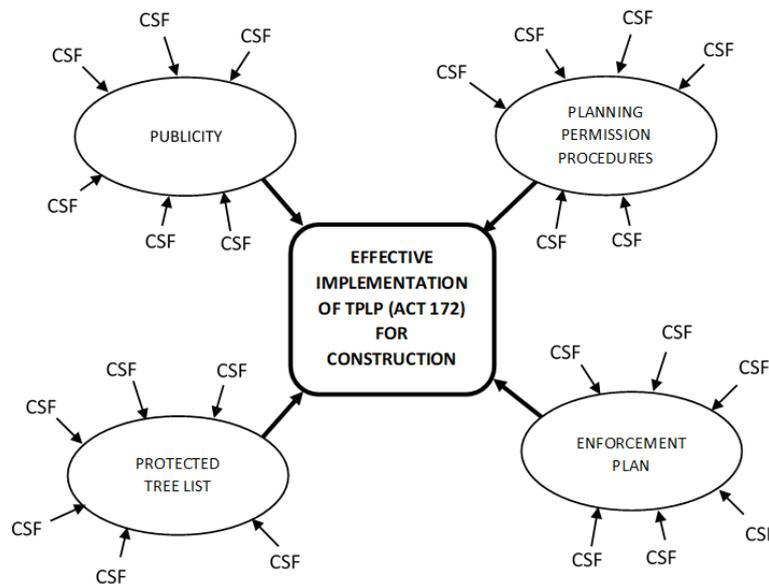


Fig. 1 Conceptual framework of effective TPLP (Act 172) implementation for construction projects simplified from Nik Adlin et al. [20]

Publicising any legislation to relevant government departments, agencies, and public servants is necessary for proper implementation and governance. In the context of this framework, "Publicity" factors cover all activities and materials that build awareness, understanding, and a willingness to learn about protecting and preserving trees during development planning. Among the activities are awareness campaigns, training courses, workshops, focus group discussions, and research surveys which involve both government officials and members of the public. The publicity materials would comprise TV advertisements, web pages, social media, billboards, course notes, manuals, guidelines, questionnaires, and institutional reports.

The second component is related to the things to be protected by TPLP (Act 172), i.e., the urban trees. The *Protected Tree List* is crucial for the effective implementation as it defines which trees are significant, providing clarity for planners and developers, ensuring consistent application of the law, and creating a foundation for robust urban forest management by identifying valuable trees for their environmental, social, and economic benefits. Hence, if effectively executed, the list of protected trees would be a factor that could define the success of implementation.

The procedures under the *Planning Permission* are related to getting planning approval from the LPA, as stated in sections 21 and 22 of the Act 172, which outline several requirements to be fulfilled to protect trees. The procedures provide a structured mechanism for local authorities to assess, protect, and manage trees before development projects begin, ensuring that the TPLP (Act 172) are not just theoretical but are actively integrated into development plans and enforced on the ground, thereby safeguarding urban trees and the benefits they provide.

The final CFS is specifically related to the enforcement aspects of TPLP (Act 172). The enforcement of any law has to have a plan, and in the case of TPLP (Act 172), the *Enforcement Plan* transforms legal provisions into practical action, ensuring compliance, deterring illegal removal, and providing the oversight and resources needed to effectively manage and maintain urban trees. Without robust enforcement, laws are merely suggestions, leading to continued tree loss from unchecked development and undermining the very goals of urban forestry.

Nevertheless, before the CSFs for the TPLP (Act 172) framework could be determined, it is necessary to be aware of all possible factors that would contribute to the success of TPLP (Act 172) implementation for construction projects. These success factors (SFs) could be obtained through a benchmarking process against countries with more established and better tree protection practices.

2. Materials and Methods

The selected countries to benchmark against Malaysia were Australia and the UK. The two countries were selected primarily because both Australia and the UK have established standards for tree protection in construction

projects: *AS 4970 – 2009 Protection of Trees on Development Sites*, and *BS 5837:2012 Trees in Relation to Design, Demolition and Construction – Recommendations*, respectively.

Camp [25] in his book, defines benchmarking as “the continuous process of measuring our products, services and practices against those of our toughest competitors or companies renowned as leaders” [26]. In the context of this study, the “leaders” to benchmark against are the two countries, and the SFs are those pertaining to their tree protection best practices. Hence, for the study to fully understand the tree protection practices in Australia and the UK, extensive reviewing of the official websites of LPAs in the countries was conducted.

The reviewing process flow was as illustrated in Figure 2. It started by selecting a LPA with a known domain name and one or more keywords or phrases related to TPLPs, for examples, TPO and Tree Protection. Next step was to open the Google search webpage and in the search bar, the following command was typed, site: LPA domain name keyword. This command lets the Google to search only in the LPA website for the webpages with the keyword or the phrase. The content of the search results (either webpages or pdf files) were read to spot any inquired information as shown in Table 1. The information was then further analysed for its relevance to key components before coded as a perceived SF. Nevertheless, the reviewing process has also taken into account information beyond those in Table 1 if deemed relevant.

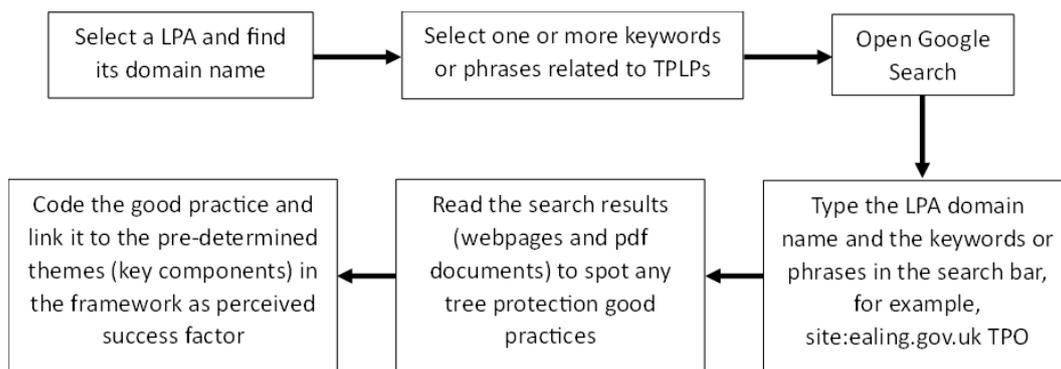


Fig. 2 Website review process flow

Table 1 List of the information inquired from the LPA websites review

No	Key Component	Description	Information Inquired
1	Publicity	Publicity of TPLPs fosters essential public awareness, support, and participation, leading to better compliance and long-term sustainability of urban forests.	<ul style="list-style-type: none"> Who should be aware of TPLPs? How are they made aware of TPLPs? How are the LPA staff made knowledgeable of TPLPs?
2	Protected Tree List	Protected tree lists provide clear, legally defensible criteria for which trees are safeguarded, offers a quantifiable and transparent mechanism for enforcement, and standardizes the regulatory process.	<ul style="list-style-type: none"> How are trees selected for protection (the criteria)? How are protected tree lists informed to the public?
3	Planning Permission Procedures	Planning permission procedures provide a formal, legal mechanism to evaluate the impact of proposed developments on existing trees, thus integrating preservation into the development process.	<ul style="list-style-type: none"> How are trees protected in the procedures? What are the requirements to be fulfilled by the applicants?
4	Enforcement Plan	Without enforcement plan, TPLPs are effectively unenforceable mandates, lacking the necessary structure for compliance, deterrence, and accountability	<ul style="list-style-type: none"> How is tree protection enforcement planned? How are complaints lodged and handled?

There are at least 337 LPAs in the UK [27] and 537 councils in Australia [28]; hence, there were 874 possible websites that needed to be reviewed. However, the total required number of LPA websites to get each inquired information (Table 1) was not set because in qualitative research, sample size is not about statistical power but about achieving data saturation, referring to the point at which no new information, themes, or patterns emerge from the data [29]. The number of websites reviewed for each inquired information depends on how clearly the information, i.e., sentences or statements, on a website reflects the inquired information. The clearer and more consistent the information gives its meaning, the less number of webpages needed to be reviewed. This approach, where the average number of websites reviewed was below 8 for each inquired information, could have imposed limitation to this study in terms of the robustness of the findings [30]. Nevertheless, since the aim of this study has been to propose SFs for the framework, and to further these SFs to discussion and verification by stakeholders, the accuracy of these current findings is not of highly critical.

The webpages and documents reviewed and analysed are as shown in Table 2 and Table 3, respectively. Also, during the reviewing process, new relevant information came-up which required reviewing the websites other than those of LPAs, for examples, of British Safety Signs, and of Standards Australia Ltd.

Table 2 List of webpages analysed

ID	Website Owner	Title of Webpage	Link
W01	Ards and North Down Borough Council (UK)	<i>TPO and Conservation Area Interactive Map</i>	https://www.ardsandnorthdown.gov.uk/article/1481/TP0-and-Conservation-Area-Interactive-Map
W02	Bassetlaw District Council (UK)	<i>Tree Preservation Order Enforcement Policy</i>	https://www.bassetlaw.gov.uk/planning-and-building-control/planning-applications/protected-trees-and-hedgerows/tree-preservation-order-enforcement-policy/
W03	Bassetlaw District Council (UK)	<i>Planning Enforcement Protocol</i>	https://www.bassetlaw.gov.uk/planning-and-building-control/planning-applications/development-management/planning-enforcement-protocol/
W04	Bath and North East Somerset Council (UK)	<i>Tree Survey or Arboricultural Statement</i>	https://www.bathnes.gov.uk/policy-and-documents-library/tree-survey-or-arboricultural-statement
W05	Baw Baw Shire Council (Australia)	<i>Significant Tree Register FAQs</i>	https://www.bawbawconnect.com.au/significanttreeregister/faqs
W06	Baw Baw Shire Council (Australia)	<i>Nominate a Significant Tree Form</i>	https://www.bawbawconnect.com.au/significant-tree-study
W07	Borough Council of King's Lynn & West Norfolk (UK)	<i>Developer nearly £8,000 worse off after damaging 27 TPO trees</i>	https://www.west-norfolk.gov.uk/news/article/1846/developer_nearly_8000_worse_off_after_damaging_27_tpo_trees
W08	British Safety Signs	<i>Site Safe - Protected trees Keep Clear sign</i>	https://britishsafetysigns.co.uk/shop/product/site-safe-protected-trees-keep-clear-sign-3597?category=273&page=8
W09	Cardinia Shire Council (Australia)	<i>Significant trees</i>	https://creating.cardinia.vic.gov.au/Significant-trees#:~:text=Significant%20trees%20are%20outstanding%20trees,on%20private%20or%20public%20land.
W10	City of Boroondara (Australia)	<i>Protected and significant trees</i>	https://www.boroondara.vic.gov.au/services/environment-and-sustainability/trees/protected-and-significant-trees
W11	City of Burnside (Australia)	<i>Council achieves conviction and \$10,000 fine for illegal tree removal</i>	https://www.burnside.sa.gov.au/Latest-News/Homepage-Latest-News/Council-achieves-conviction-and-10000-fine-for-illegal-tree-removal

ID	Website Owner	Title of Webpage	Link
W12	City of Burnside (Australia)	<i>Council achieves successful prosecution for illegal felling</i>	https://engage.burnside.sa.gov.au/FOCUSOnBurnside/news_feed/council-achieves-successful-prosecution-for-illegal-felling
W13	City of Burnside (Australia)	<i>Tree Vandalism</i>	https://www.burnside.sa.gov.au/Environment-Sustainability/Trees/Tree-Vandalism
W14	City of Canning Council (Australia)	<i>Significant Tree Register</i>	https://www.canning.wa.gov.au/residents/environment-and-sustainability/significant-tree-register/#:~:text=A%20Significant%20Tree%20Register%20protects,and%20are%20important%20for%20biodiversity.
W15	City of Canterbury Bankstown Council (Australia)	<i>Developer cops \$45k fine for destroying protected tree</i>	https://www.cbccity.nsw.gov.au/your-council/media-centre/developer-cops-45k-fine-destroying-protected-tree
W16	City of Parramatta Council (Australia)	<i>Trees and Development</i>	https://www.cityofparramatta.nsw.gov.au/environment/trees/trees-and-development
W17	City of Stonnington Council (Australia)	<i>Report a planning permit breach or unlawful tree works online</i>	https://www.stonnington.vic.gov.au/Planning-and-building/Planning/Planning-enforcement/Report-a-planning-breach/Report-a-planning-breach-or-unlawful-tree-works
W18	Duncan Lewis (Solicitors) Limited (UK)	<i>Housing developer prosecuted for breaching Tree Preservation Order (31 January 2017)</i>	https://www.duncanlewis.co.uk/housing_news/Housing_developer_prosecuted_for_breaching_Tree_Preservation_Order_(31_January_2017).html
W19	Ealing Council (UK)	<i>Trees and planning applications</i>	https://www.ealing.gov.uk/info/201232/privately-owned_trees/2009/trees_and_planning_applications
W20	East Suffolk Council (UK)	<i>Trees on development sites</i>	https://knowledge.bsigroup.com/products/trees-in-relation-to-design-demolition-and-construction-recommendations
W21	Eastleigh Borough Council (UK)	<i>Tree enquiries and online map</i>	https://www.eastleigh.gov.uk/environment/tree-services/tree-enquiries-and-online-map
W22	Eastleigh Borough Council (UK)	<i>Trees and the planning system</i>	https://www.eastleigh.gov.uk/environment/tree-services/a-brief-guide-to-legislation-for-trees/trees-and-the-planning-system
W23	Erewash Borough Council (UK)	<i>Planning Enforcement Plan 2022</i>	https://www.erewash.gov.uk/planning/planning-information/planning-enforcement-plan-2022
W24	Falkirk Council (UK)	<i>Planning enforcement</i>	https://www.falkirk.gov.uk/development-management/planning-enforcement
W25	Get Signs (Australia)	<i>Tree Protection Zone - Keep Out Signs</i>	https://getsigns.com.au/products/tree-protection-zone-keep-out-sign?srsltid=AfmBOoppXiXGh4eNI0zKzu6ijwH4VaZKhdyWkXOB-U00NXeBhDoAKYyA
W26	Godwins Tree Surveys (UK)	<i>BS5837 Tree Survey</i>	https://www.godwins.co.uk/bs5837-tree-survey

ID	Website Owner	Title of Webpage	Link
W27	GOV.UK	<i>Tree Preservation Orders and trees in conservation areas</i>	https://www.gov.uk/guidance/tree-preservation-orders-and-trees-in-conservation-areas
W28	Knox City Council (Australia)	<i>Planning investigation and compliance</i>	https://www.knox.vic.gov.au/our-services/building-and-planning/planning/planning-investigation-and-compliance
W29	National Association of Local Councils (UK)	<i>Tree management</i>	https://www.nalc.gov.uk/campaigns/tackling-climate-change/tree-management.html
W30	New Signs (Australia)	<i>Tree Protection Signs</i>	https://newsigns.com.au/collections/tree-protection-signs/tree-protection-signs?srltid=AfmBOopJ9up-VKAO2aYW9p04SDRJGdGzPTuSAHNV_9U0dYgigSwyYVB4
W31	Newark & Sherwood District Council (UK)	<i>TPO criteria</i>	https://www.newark-sherwooddc.gov.uk/tpocriteria/
W32	North Sydney Council (Australia)	<i>Trees in Development Applications</i>	https://www.northsydney.nsw.gov.au/getting-construction-underway/trees-development
W33	NSW Government (Australia)	<i>Delivering greening through planning controls</i>	https://www.planning.nsw.gov.au/policy-and-legislation/resilience-and-natural-hazard-risk/urban-heat/cooler-places/using-planning-strategies-and-controls-for-cooling/delivering-greening-through-planning-controls
W34	Royal Society for the Protection of Birds (RSPB) (UK)	<i>What protections do trees have when it comes to planning?</i>	https://www.rspb.org.uk/helping-nature/what-you-can-do/planning-for-nature-toolkit/england-planning-system/other-decision-making-processes/protection-for-trees
W35	Rugby Borough Council (UK)	<i>Developer fined £5,000 for breaching Tree Preservation Order</i>	https://www.rugby.gov.uk/w/developer-fined-5-000-for-breaching-tree-preservation-order-
W36	Safety Signs and Notices Ltd (UK)	<i>Tree Protection Area Keep Out Sign - Town and Planning Act 1990 Sign</i>	https://www.safetysignsandnotices.co.uk/tree-protection-area-keep-out-sign-town-and-planning-act-1990-sign
W37	Standards Australia Ltd	<i>AS 4970:2025 Protection of trees on development sites</i>	https://store.standards.org.au/product/as-4970-2025
W38	Thanet District Council (UK)	<i>Planning enforcement - Tell us about a planning breach</i>	https://www.thanet.gov.uk/info-pages/planning-enforcement/
W39	Three Rivers District Council (UK)	<i>Three Rivers Prosecutes Developer for Illegal Damage to Protected Trees</i>	https://www.threerivers.gov.uk/news/three-rivers-prosecutes-developer-for-illegal-damage-to-protected-trees
W40	Three Rivers District Council (UK)	<i>Man who illegally destroyed protected trees is fined £16,000</i>	https://www.threerivers.gov.uk/news/man-who-illegally-destroyed-protected-trees-is-fined-16-000
W41	Thurrock Council (UK)	<i>Protected buildings and trees</i>	https://www.thurrock.gov.uk/planning-enforcement/protected-buildings-and-trees

ID	Website Owner	Title of Webpage	Link
W42	UK Safety Store	<i>Tree Protection Area Keep Out Sign</i>	https://www.uksafetystore.com/tree-protection-area-keep-out-sign.html?srsltid=AfmB0oqKtsS6n-IE4J9aFktqLtDXMpVWA_d3ey06wgEoI90QcCxc7ZOy
W43	Whitehorse City Council (Australia)	<i>Council continues its advocacy for permanent tree controls</i>	https://www.whitehorse.vic.gov.au/news-and-media/council-continues-its-advocacy-permanent-tree-controls
W44	Wychavon District Council (UK)	<i>Tree Preservation Orders (TPO)</i>	https://www.wychavon.gov.uk/planning/heritage-and-conservation/protected-trees
W45	East Devon District Council (UK)	<i>Trees subject to planning conditions - East Devon</i>	https://eastdevon.gov.uk/trees/tree-preservation-orders-and-trees-protected-in-conservation-areas/trees-subject-to-planning-conditions/

Table 3 List of documents analysed

ID	Website Owner	Document Title	Link
D01	Ards and North Down Borough Council (UK)	<i>Tree and Woodland Strategy 2021-2032</i>	https://www.ardsandnorthdown.gov.uk/media/245/Parks-and-Woodland-Strategy/pdf/o7Ards_and_North_Down_Tree_and_Woodland_Strategy_.pdf?m=1706536175620
D02	Bass Coast Shire Council (Australia)	<i>Arboricultural Report Writing Guide</i>	https://www.basscoast.vic.gov.au/assets/general-images/Bass-Coast-Arborist-Report-Guidelines-1-1.pdf
D03	Blacktown City Council (Australia)	<i>Tree Management Strategy August 2022</i>	https://www.blacktown.nsw.gov.au/files/assets/public/v/1/tree_management_strategy_book_6pdf.pdf
D04	Bracknell Forest Council (UK)	<i>Bracknell Forest Borough Tree Strategy</i>	https://www.bracknell-forest.gov.uk/sites/default/files/2021-11/bfc-tree-strategy.pdf
D05	Camden Council (UK)	<i>Camden Planning Guidance: Trees March 2019</i>	https://www.camden.gov.uk/documents/20142/4823269/Trees+CPG+March+2019.pdf/985e3c70-d9a5-6ded-a5a3-3c84616f254d
D06	Campbelltown City Council (Australia)	<i>National Urban Forest Alliance Australian Partnership Plan 2014-2020</i>	https://www.campbelltown.sa.gov.au/_data/assets/pdf_file/0022/235444/NUFA-Partnership-Plan-2014-2020.pdf
D07	Cheltenham Borough Council (UK)	<i>Planning Enforcement Plan November 2024</i>	https://democracy.cheltenham.gov.uk/documents/s49003/Appendix+3+-+Planning+Enforcement+Plan+Cabinet.pdf
D08	City of Bayswater (Australia)	<i>Significant Tree Register for Private Land Guidelines</i>	https://www.bayswater.wa.gov.au/online-services/forms-and-publications/policies/2025/significant-tree-register-for-private-land-guideli
D09	City of Kingston Council (Australia)	<i>Arboricultural Reporting Guidelines for Planning and Development</i>	https://www.kingston.vic.gov.au/files/sharedassets/public/hptrim/communications-website-and-online-development-corporate-website-documents/kingston-guidelines-for-tree-assessment-planning-applications.pdf
D10	City Services ACT Government (Australia)	<i>2024 Report to the Legislative Assembly of the Australian Capital Territory</i>	https://www.cityservices.act.gov.au/_data/assets/pdf_file/0006/2324634/Urban-tree-canopy-coverage-report-2024-Access.pdf

ID	Website Owner	Document Title	Link
D11	Communities and Local Government (UK)	<i>Tree Preservation Orders: A Guide to the Law and Good Practice</i>	https://assets.publishing.service.gov.uk/media/5a790b1d40f0b679c0a08161/tposguide.pdf
D12	Coventry City Council (UK)	<i>Coventry Urban Forestry Strategy 2022-2032</i>	https://www.coventry.gov.uk/downloads/file/38432/coventry-urban-forestry-strategy-2022-2032
D13	Derry City and Strabane District Council (UK)	<i>Criteria for TPO Consideration</i>	https://www.derrystrabane.com/getmedia/6290ce48-d34f-4400-a03b-e627993a9c66/1b-Criteria-for-TPO-Consideration-DC-SDC,-Jan-2020-(1)_1.pdf
D14	Dundee City Council (UK)	<i>Tree Protection Legislation</i>	https://dundeecity.gov.uk/sites/default/files/Tree%20Protection%20Legislation.pdf
D15	Dundee City Council (UK)	<i>Trees & Development</i>	https://www.dundeecity.gov.uk/sites/default/files/publications/trees_development_introduction_2015_update_29-10-20.pdf
D16	East Lindsey District Council (UK)	<i>Policy Guidance Note:TP1 Public Amenity Assessment August 2010</i>	https://www.e-lindsey.gov.uk/media/4314/Public-Amenity-Assessment/pdf/Appendix C Public Amenity Assessment PGN.pdf
D17	Eastleigh Borough Council (UK)	<i>Trees and Development Supplementary Planning Document</i>	https://www.eastleigh.gov.uk/media/11241/adopted-trees-and-development-spd-april-22.pdf
D18	Forest Research (UK)	<i>Public Perceptions of Urban Trees</i>	https://cdn.forestresearch.gov.uk/2021/01/pput._focus_group_findings_final_aa.pdf
D19	Greater London Authority (UK)	<i>London Urban Forest Plan November 2020</i>	https://www.london.gov.uk/sites/default/files/londonurbanforestplan_final.pdf
D20	Hart District Council (UK)	<i>Tree Risk Management Policy 2020</i>	https://www.hart.gov.uk/sites/default/files/2023-08/Tree-Risk-Management-Policy.pdf
D21	Havant Borough Council (UK)	<i>Tree and Woodland Strategy 2022-2026</i>	https://www.havant.gov.uk/sites/default/files/documents/Tree%20and%20woodland%20strategy.pdf
D22	Hobart City Council (UK)	<i>Street Tree Strategy 2017</i>	https://www.hobartcity.com.au/files/assets/public/v/2/council/strategies-plans-and-reports/street-tree-strategy.pdf
D23	Kent County Council (UK)	<i>Protecting Trees on Development Sites</i>	https://www.kent.gov.uk/_data/assets/pdf_file/0020/11639/protecting-trees-on-development-sites.pdf
D24	Leicester City Council (UK)	<i>Trees: Enforcement Procedure</i>	https://cabinet.leicester.gov.uk/documents/s28013/Trees%20enforcement%20procedure%20document.pdf
D25	Leicestershire County Council (UK)	<i>Tree Management Strategy 2020-2025</i>	https://www.leicestershire.gov.uk/sites/default/files/field/pdf/2021/2/16/Tree-Management-Strategy-2020-2025.pdf
D26	Macedon Ranges Shire Council (Australia)	<i>Tree protection guidelines for developments</i>	https://www.mrsc.vic.gov.au/files/assets/public/v/6/live-amp-work/environment/tree-protection-booklet-web-may-2022.pdf

ID	Website Owner	Document Title	Link
D27	Merri-bek City Council (Australia)	<i>Planning Scheme Review 2022 October 2022</i>	https://www.merri-bek.vic.gov.au/globalassets/website-merri-bek/areas/building-business/planning-and-building/strategic-planning/planning-scheme-review-report-2022-final.pdf
D28	Mid Devon District Council (UK)	<i>Planning Enforcement Policy 2024</i>	https://www.middevon.gov.uk/media/356795/mddc-planning-enforcement-policy-2024.pdf
D29	Mildura Rural City Council (Australia)	<i>MRCC Significant Tree Register 2020</i>	https://www.mildura.vic.gov.au/files/assets/public/document-resources/services/planning-amp-building/strategic-planning-reports-and-strategies/significant-tree-register-2020-final-report-mrcc-endorsed-27-may-2020.pdf
D30	Moray Council (UK)	<i>Trees and Development</i>	http://www.moray.gov.uk/downloads/file91739.pdf
D31	Mount Alexander Shire Council (Australia)	<i>Compliance and Enforcement Policy</i>	https://www.mountalexander.vic.gov.au/files/assets/public/files/3.-your-council/council-meetings/past-agendas-amp-minutes/2020/ordinary_meeting_of_council_21_july_2020_-_attachments.pdf
D32	National Trust (Australia)	<i>Significant Tree Protection Understanding Significance & the Law</i>	https://www.nationaltrust.org.au/wp-content/uploads/2016/06/Tree-Protection-in-Australia_National-Trusts-of-Australia.pdf
D33	New Forest District Council (UK)	<i>Tree Protection and Development Guidance 2020</i>	https://www.newforest.gov.uk/media/682/Tree-Protection-and-Development-Guidance/pdf/Trees_and_Development_Guidance_2020_-_APP_1.pdf?m=1593792360933
D34	Norfolk County Council (UK)	<i>Tree Safety Management Policy - January 2025</i>	https://www.schools.norfolk.gov.uk/media/13504/Tree-safety-management-policy/pdf/g2Tree_safety_management_policy_v4_2025_accessible.pdf?m=1738337579517
D35	NSW Ombudsman (Australia)	<i>Enforcement guidelines for councils - December 2015</i>	https://cmsassets.ombo.nsw.gov.au/assets/Resources/Guidelines/Enforcement-Guidelines-for-councils.pdf
D36	Oxford City Council (UK)	<i>Tree Management Policy 2024-2032</i>	https://mycouncil.oxford.gov.uk/documents/s79245/Tree%20Management%20Policy%202024-2032.pdf
D37	Portsmouth City Council (UK)	<i>Manual for managing trees on development sites</i>	https://www.portsmouth.gov.uk/wp-content/uploads/2023/05/CD-1-10-MANUAL_FOR_MANAGING_TREES_ON_CONSTRUCTION_SITES_V3-2376135.pdf
D38	Randwick City Council (Australia)	<i>Tree Management Technical Manual - 2103</i>	https://www.randwick.nsw.gov.au/_data/assets/pdf_file/0013/23404/Tree-Management-Technical-Manual-17-July-2017.pdf
D39	Ribble Valley Borough Council (UK)	<i>Tree Protection Scheme</i>	https://webportal.ribblevalley.gov.uk/planx_downloads/23_0052_Tree_Protection_Scheme.pdf
D40	Somerset Council (UK)	<i>Tree Protection Plan and Arboricultural Method Statement - February 2024</i>	https://ssdc.somerset.gov.uk/my-requests/document-viewer?DocNo=12441290

ID	Website Owner	Document Title	Link
D41	Swan Hill Rural City Council (Australia)	<i>Urban Tree Management Plan</i>	https://www.swanhill.vic.gov.au/Our-Council/Plans-policies-strategies-and-corporate-documents/Urban-Tree-Management-Plan
D42	Sydney Olympic Park Authority (Australia)	<i>Guidelines for the Protection of Trees on Construction Sites - October 2004</i>	https://www.sydneyolympicpark.nsw.gov.au/sites/default/files/2023-11/protection_of_trees_guidelines.pdf
D43	Tandridge District Council (UK)	<i>Tree Preservation Orders – Administration and Service Guidelines - 2014 Revision</i>	https://www.tandridge.gov.uk/Portals/0/Documents/Planning%20and%20building/Conservation%20and%20trees/Tree%20preservation%20orders/TPO-Guidelines.pdf
D44	Tandridge District Council (UK)	<i>Planning Enforcement Policy - June 2024</i>	https://www.tandridge.gov.uk/Portals/0/Documents/Planning%20and%20building/Planning%20applications%20and%20enforcement/What%20if%20someone%20does%20not%20follow%20the%20planning%20rules/Enforcement-Plan-June-2024.pdf?ver=Z9xvfzm2w8eVQ-px5t_Heg%3D%3D
D45	The National Capital Authority (Australia)	<i>Tree Management Policy - May 2021</i>	https://www.nca.gov.au/sites/default/files/2022-04/NCA_Tree%20Management%20Policy.pdf
D46	Tonbridge and Malling Borough Council (UK)	<i>Tree Protection Enforcement Protocol - June 2021</i>	https://www.tmbc.gov.uk/downloads/file/1929/annex-1-tree-protection-enforcement-protocol-draft
D47	Torbay Council (UK)	<i>Amenity Evaluation for Tree Preservation Orders</i>	https://www.torbay.gov.uk/media/16886/1563_treepreservation.pdf
D48	Wyndham City Council (Australia)	<i>Tree and Urban Forest Policy - 2021</i>	https://www.wyndham.vic.gov.au/sites/default/files/2021-11/Tree%20and%20Urban%20Forest%20Policy%20Adopted%2028%20Sep%202021.pdf

3. Results and Discussions

Tables 4, 5, 6, and 7 present the perceived SFs related to *Publicity*, *Protected Tree Lists*, *Planning Permission Procedures*, and *Enforcement Plans*, respectively, as deduced from the analysed webpages and documents. The updated Framework of Effective TPLP (Act 172) Implementation for Construction Projects with proposed potential CSFs for Malaysia is illustrated in Figure 2.

3.1 Publicity

The first SF in the *Publicity* component (Table 4) is about making the public aware of the existence of TPLPs. The awareness would empower the community to actively participate in protecting vital urban green spaces and to support enforcement and legal compliance, hence preventing unauthorised tree felling. Through webpages, LPAs introduce and give an explanation about TPOs (W01, W27, W44), Significant Trees (W05, W10), and elaborate on how TPOs would affect planning permission applications (W34). Moreover, certain documents that were made available on the LPAs' websites (D04, D05, D10) mentioned the TPLPs for the public to download. Other downloadable documents, such as D11 and D14, are exclusively about TPLPs. According to a survey by Forest Research UK (D18), the most effective way to communicate with the public about urban trees is through LPA websites.

Table 4 List of perceived success factors related to publicity

No	Success Factor	Rationale	Link
1	The public is made aware of urban TPLPs' existence.	The awareness empowers the community to actively participate in protecting vital urban green spaces and to support enforcement and legal compliance, which prevents unauthorised tree felling and promotes sustainable urban development.	W01, W05, W10, W27, W34, W44, D04, D05, D10, D11, D14, D18
2	Various public awareness tools are used: websites, community engagement, tree planting campaigns, environmental education programmes and NGOs' involvement.	Having multiple methods for raising public awareness on urban tree protection is crucial because it reaches diverse audiences, addresses varying levels of interest, and encourages a broader range of participation.	W01, W05, W10, W27, W29, W34, W44, D01, D03, D04, D06, D10, D12, D19, D21, D22, D36, D41, D45, D48
3	Awareness and knowledge of LPA staff on urban TPLPs and tree management are gained through regular training.	Proper training ensures staff can correctly apply TPLPs, like issuing Tree Preservation Orders (TPOs), and have the necessary skills to manage tree health, leading to better environmental outcomes and fewer legal or public relations issues.	D03, D06, D12, D20, D21, D34, D45

Secondly, the factor of success also depends on the different approaches LPAs use to inform the public about the need for urban tree protection. Having multiple methods is crucial as it can reach diverse audiences, address varying levels of interest, and encourage a broader range of participation. Other than via webpages, the public awareness is also gained through community engagement as mentioned by the LPAs in their online documents on tree strategy (D01, D03, D12, D21, D22, D48), tree management policy or plan (D36, D41, D45), urban forest plan (D06, D19), and urban tree canopy coverage report (D10). Moreover, a tree planting campaign or programme is another method being conducted by the LPAs to increase awareness. The campaign emphasizes the role of tree cover in climate action, illustrating the critical need for natural carbon removal systems (W29, D01, D04, D21). Tree planting programmes that often require involvement from the public are strongly emphasised in D10, D12, D19 and D22. Some tree planting programmes also include environmental education activities (D03, D10) and involvement by NGOs (D12, D19).

The third SF is the regular training provided by the LPAs that would enhance the awareness and knowledge of their staff on urban TPLPs and tree management. Training ensures staff can correctly apply TPLPs (D21, D45) and have the necessary skills to manage tree health (D03, D20, D34), leading to better environmental outcomes (D06, D12) and fewer legal or public relations issues.

3.2 Protected Tree List

The first SF related to the *Protected Tree List* (Table 5) is that LPAs share the information about their protected urban trees with the public through websites. Making protected tree lists accessible online is important because it informs the public and tree owners about trees that have legal protection, allowing them to understand their responsibilities and preventing accidental damage or destruction. The accessibility also supports community involvement in conservation efforts by making it easy to verify if a tree is protected before planning work, and provides a transparent way for the public to report violations. Such LPA webpages direct the users to interactive maps showing the trees protected by the various TPLPs, such as Significant Trees (W10), and TPOs (W21). Some LPAs have also published online documents containing information about the protected trees (D29, D40).

The second SF in the *Protected Tree List* component is the availability of guidelines for selecting trees to be protected. These guidelines provide a clear framework for assessing trees, prevent subjective decisions, and enable the creation of robust TPOs that are legally defensible. Without the guidelines, the protection of trees is left to the discretion of individuals, which can lead to the loss of significant trees due to a lack of expertise or external pressures. For the Significant Tree, such guidelines can be found in W05, W09, D08 and D32, while for TPOs, the guidelines are as shown in W31, D13, D16, D43 and D47.

Table 5 List of perceived success factors related to protected tree list

No	Success Factor	Rationale	Link
1	Information about protected urban trees is made accessible <i>via</i> LPA websites.	Making protected tree lists accessible online is important because it informs the public and tree owners about which trees have legal protection, allowing them to understand their responsibilities and preventing accidental damage or destruction.	W10, W21, D29, D40
2	Guidelines for selecting trees to be protected are available.	Having guidelines for nominating trees for protection would ensure a consistent and objective process for identifying and preserving trees that are important for public amenity, health, and environmental value.	W05, W09, W31, D08, D13, D16, D32, D43, D47
3	The public can nominate urban trees to be protected (via website)	Public nomination is important because it allows citizens to identify historically, culturally, or environmentally significant trees that authorities might overlook, fostering a sense of community ownership and ensuring a more comprehensive protection of urban trees.	W06, W09, W14, W10
4	Long-term protection of urban trees is secured by TPOs (or Significant Trees) rather than by planning conditions.	A Tree Preservation Order (TPO) is generally considered better than standard planning conditions for protecting urban trees because it is a legal order that prohibits a wide range of destructive actions without permission, creating a strong legal deterrent.	W22, D05, D33, D43

The third SF, that was not in the inquired information list, is about allowing the public to nominate urban trees to be protected, and the process can be accomplished online (W06, W09, W10, W14). Public nomination is important as it allows citizens to identify historically, culturally, or environmentally significant trees that authorities might overlook, fostering a sense of community ownership and ensuring a more comprehensive protection of urban trees. This also counteracts the common perception of trees as either a nuisance or a liability, and it helps to protect trees that may not be on official inventories but are still valuable to the public.

The final SF in the *Protected Tree List* is about the principal understanding held by LPAs that TPO is a long-term tree protection measure that should take precedence over the planning conditions (W22, D33). A TPO is generally considered better than planning conditions for protecting urban trees because it is a legal order that prohibits a wide range of destructive actions without permission, creating a strong legal deterrent. Unlike planning conditions, which can be specific to a development, a TPO protects individual trees, groups, or woodlands based on their amenity value and can lead to significant fines or imprisonment for non-compliance. D33 reports that the LPA has made over 1,500 TPOs since 1950. According to another document D43, the LPA holds nearly 800 TPOs, protecting thousands of trees. UK LPAs can protect valuable trees with a TPO before development is approved, if the trees offer a notable public benefit (D05).

3.3 Planning Permission Procedures

The list of SFs in the *Planning Permission Procedures* (Table 6) begins with Tree Survey (also termed as Arboricultural Statement or Arborist Report) as an essential part of the Planning Application. A requirement of a tree survey report for planning permission is important to protect valuable trees, manage the impact of a development, ensure public safety, and streamline the approval process. The report provides LPAs with the information they need about the trees on the site to assess potential risks, assess the impact of development, and inform decisions about site layout and tree protection methods. A tree survey should be submitted as early as during the pre-planning and design stage of construction projects (D05, D26), accompanied by an Arboricultural Impact Assessment (AIA) report, tree retention/removal plan, and Arboricultural Method Statement (AMS) with Tree Protection Plan (TPP) (W04, W16, W19, D17, D23). A Tree Constraints Plan (TCP) should be prepared once the trees suitable for preservation have been identified. TCP is a map that visually represents these constraints to help designers and architects plan construction, ensuring compliance with regulations and minimising conflict with trees. The TCP, when included with a planning application, must demonstrate how the proposed site layout gives due consideration to retaining trees (D15).

To have guidelines available online for conducting tree surveys (D02, D09, D30) and other tree protection requirements (D33, D37, D38, D39, D42) is another SF as it would ensure consistent, compliant, and efficient

planning processes for developers and the public. These guidelines provide clarity on requirements and the LPAs' expectations for tree protection, which prevents project delays, clarifies procedures, and promotes the effective management and preservation of urban trees. Moreover, the fact that all the above guidelines mention the standards to comply with, such as BS 5837:2012 and AS 4970:2009, has led to the third SF of this component, which is, national standards for tree protection in construction projects are made available for the stakeholders.

Table 6 List of perceived success factors related to planning permission procedures

No	Success Factor	Rationale	Link
1	A tree survey (arboricultural statement or arborist report) is an essential part of the Planning Application.	Requiring a tree survey report for planning permission is important to protect valuable trees, manage the impact of a development, ensure public safety, and streamline the approval process.	W04, W16, W19, D05, D15, D17, D23, D26
2	Guidelines for the Tree Survey report and other tree protection requirements in construction projects are accessible on LPA websites.	Publishing tree protection requirement guidelines online would ensure consistent, compliant, and efficient planning processes for developers and the public.	D02, D09, D30, D33, D37, D38, D39, D42
3	National standards for tree protection in construction projects are available for the stakeholders.	Having the standard is important because it would enhance consistency, quality, and efficiency in the efforts of preserving the environmental, economic, and aesthetic benefits of trees.	W20, W26, W37
4	Tree protection planning conditions are imposed whenever possible.	Imposing planning conditions to protect trees is crucial because they are vital for environmental benefits like mitigating climate change, providing natural habitats, and improving well-being.	W16, W19, W22, W33, W43, D05, D27

Standards are vital for ensuring that our efforts to preserve urban trees are consistent, high-quality, and efficient. This structured approach helps maintain the significant environmental, economic, and aesthetic advantages trees offer, such as better air and water quality, effective stormwater management, and robust biodiversity support. These standards prevent construction-related damage, ensure compliance with legal and sustainable development goals, and mitigate risks associated with soil compaction, root damage, and canopy stress. Webpages W20 and W37 provide a link that directs the users to purchase the British standard (BS 5837:2012 - Trees in relation to design, demolition and construction) and the Australian standard (AS 4970:2025 - Protection of trees on development sites), respectively. Tree Survey is also termed as BS5837 Tree Survey (W26) to reflect the fact that it has to be conducted according to the standard.

The fourth SF is about how steadfast the LPAs are in imposing planning conditions related to trees. Imposing planning conditions to protect trees is crucial because trees are vital for environmental benefits like mitigating climate change, providing natural habitats, and improving well-being. These conditions ensure that development projects consider and protect existing trees (whether TPO trees, significant trees or other healthy trees at the sites), or require the planting of new ones, in a way that is necessary, enforceable, and reasonable.

Some LPAs have shown their commitment on tree preservation in their webpages about development and planning application by making the statement such as a) *All developments should be designed to enable the preservation, and the long-term viability of trees* (W16), b) *When considering planning applications, the council has a statutory duty to protect trees* (W19), and c) *LPAs have a statutory duty to consider the protection and planting of trees when granting planning permission for proposed development* (W22). This commitment is also clearly implied in the title of LPA webpages, such as a) *Delivering greening through planning controls* (W33), and b) *Council continues its advocacy for permanent tree controls* (W43). Other LPAs have documented this commitment as a policy or strategy relevant to planning, for example, a) *Using our planning powers and British Standard BS5837:2012, the Council will aim to preserve existing tree and canopy coverage where possible* (D05), and b) *Protect existing trees and plant more trees through development controls* (D27).

3.4 Enforcement Plan

For the *Enforcement Plan* (Table 7), the first SF is that LPAs have included tree protection as part of their enforcement plan, as mentioned in their webpages (W02, W03, W23, W28, W41). Among others, the plans which

are published as documents (D28, D31, D44, D46) comprise clear policies or protocols for handling general tree protection breaches, and unauthorised works on protected trees in construction projects, as well as damage to the protected trees. Moreover, it would also ensure the LPAs are ready to implement TPLPs and can take enforcement action, including potential prosecution for illegal activities, especially in construction projects. Some LPAs have developed a tree enforcement procedure flow chart to describe graphically how a tree-related complaint should be handled (D07, D24).

The second SF pertaining to the enforcement is by allowing the public to lodge complaints about tree breaches, and the process is expedited via e-mail (W03), by filling out the complaint forms online (W17, W23, W38), or by submitting the forms downloaded from the LPA website (W24). Allowing the public to report urban tree protection breaches online is important as it enables faster response times, provides crucial data for enforcement, and empowers citizens to act as stewards of their urban forest. This public-private partnership leverages community awareness and participation to protect valuable trees that provide numerous environmental and social benefits.

Next, the third SF was not among the inquired information but is considered relevant. It is about making the public aware of the consequences of breaching TPLPs. This awareness is crucial for deterring illegal tree removal and also fostering shared responsibility for maintaining a healthy urban environment. Understanding the penalties, which can include significant fines or even imprisonment, ensures that the public and the construction industry comply with TPLPs. Many LPAs shared information on their websites about convicted tree breaching cases. Among the convictions were: a £8,000 fine for a developer after damaging 27 TPO trees (W07), a \$10,000 fine for an individual who felled two regulated gum tree (W11), a \$7,000 fine for a tree works company when its workers illegally removed a regulated eucalyptus tree (W12), a \$45,000 fine handed down to a developer for destroying a protected 80-year-old oak tree (W15), a £10,000 fine for a housing developer after breaching TPO trees involving a yew tree and a chestnut tree (W18), and a £5,000 fine for a housing developer after cutting-down three trees of ash and two trees of cherry that were protected by TPO (W35). Moreover, some LPAs also broadcast trees that had been vandalised on their websites to seek information from anyone who might have witnessed the offences to help with the investigation (W13).

Table 7 List of perceived success factors related to the enforcement plan

No	Success Factor	Rationale	Link
1	Tree protection is a component of LPAs' Enforcement Plan.	It is important for Local Planning Authorities (LPAs) to have tree protection in their Enforcement Plan to provide a framework for legally protecting trees, which prevents illegal felling and damage during development, and ensures the environmental and amenity benefits of trees are maintained.	W02,W03, W23, W28, W41, D07, D24, D28, D31, D35, D44, D46
2	The public can lodge tree protection breaches online	Allowing the public to report urban tree protection breaches online is important because it enables faster response times, provides crucial data for enforcement, and empowers citizens to act as stewards of their urban forest.	W03, W17, W23, W24, W38
3	The public is made aware of the consequences of breaching TPLPs.	Public awareness of the consequences of breaching urban tree protection laws is crucial for deterring illegal tree removal, protecting valuable green infrastructure, and fostering shared responsibility for maintaining a healthy urban environment.	W07, W11, W12, W13, W15, W18, W28, W35, W39
4	Tree protection signages are put at sites and are made clear and readable	Clear tree protection signs are crucial because they serve as a visual warning to workers and the public, clearly delineating areas where construction or other activities are prohibited to protect the tree's roots, trunk, and canopy from damage.	W08, W25, W30, W36, W42

The final SF in the *Enforcement Plan* is to put up signages that clearly inform of the presence of protected trees at construction sites. Clear and readable tree protection signage is vital. It acts as a visual warning for

workers and the public, marking off areas where construction or other work isn't allowed. This helps prevent damage to the trees' roots, trunk, and canopy. Tree protection signage can be purchased online, such as from W08, W36 and W42 in the UK, and W25 and W30 in Australia. Some of the signages also mention related legislation, such as *TREE PROTECTION AREA - KEEP OUT! (TOWN AND PLANNING ACT 1990)*(W36), and the standard (EN ISO 7010:2020) they conform to (W42). Relating this SF in the context of the Malaysian construction industry, it can be suggested that the frequency with which such signs are erected on site would reflect the level of implementation of the TPLP (Act 172).

3.5 Updated Framework of Effective TPLP (Act 172) Implementation for Construction Projects

The updated framework (Figure 3) outlines factors to be critically considered by the Malaysian LPAs to ensure the effectiveness of TPLP (Act 172) implementation for construction projects. First and foremost, the CSF pertains to the awareness of the public, construction industry, and the LPA staff on TPLP (Act 172) and why the laws are put in place. For LPA staff, the awareness can be gained through regular training, while for the public and the construction industry, the awareness goals can be achieved by having the TPLP (Act 172) as a subject matter in community engagement activities, which also include education programmes and NGOs' involvement. The Malaysian LPAs have shown some efforts to engage the community in pursuing sustainability-related agendas such as Local Agenda 21 (LA21) and Sustainable Development Goals through initiatives like public consultations and clean-up campaigns [31, 32, 33]. Moreover, as far as the tree planting programme is concerned, Malaysia as a nation has launched the *Kempen 100 Juta Pokok* or 100 Million Tree-Planting Campaign to plant 100 million trees from 2021 to 2025 to increase green cover, raise environmental awareness, and foster a love for nature [34]. With the theme "Greening Malaysia: Our Trees, Our Life", the campaign aims to ensure Malaysia maintains at least 50% forest and tree cover by promoting the participation of government agencies (including LPAs), corporations, NGOs, educational institutions, and the public in tree-planting activities. The LPAs in Malaysia should strive to publicise TPLP (Act 172) throughout the tree planting campaign; otherwise, the opportunity would have been wasted.

Having a website is common for the LPAs, and it is almost certain that every LPA in Malaysia has its own website. Hence, as in the UK and Australia, the Malaysian LPAs too should fully utilise the internet as a medium to inform the public and construction industry about TPLP (Act 172), the locations of the protected trees and tree survey report guidelines. Moreover, through the internet, the LPAs can invite the public to nominate trees for protection and to report tree protection breaches.

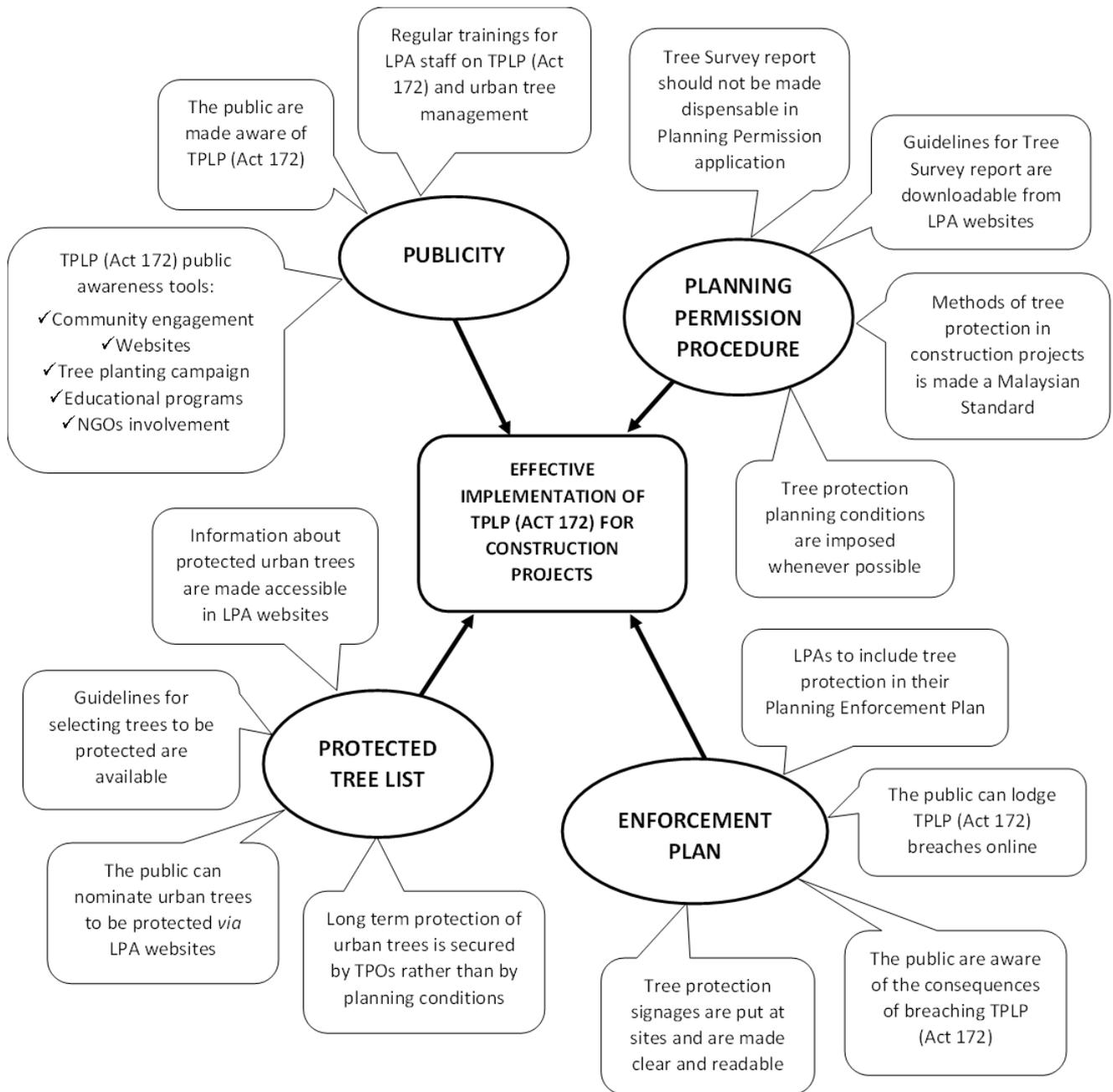


Fig. 3 Framework of effective TPLP (Act 172) implementation for construction projects with potential CSFs

The LPAs in Malaysia should exercise the power given to them through Act 172 to make as many TPOs as possible to protect urban trees in the long term. If, for whatever reasons, they are unable to make TPOs regularly, then the LPAs should ensure that for any planning application involving trees at sites, a tree survey report must be made compulsory for the applicant. Next, the LPAs should be committed to imposing tree protection planning conditions whenever applicable.

Malaysia should start thinking about having a national standard similar to the BS 5837:2012 and AS 4970:2025. The standard would help ensure that construction projects are more sustainable by providing systematic guidance on retaining, protecting, and integrating trees, supporting existing regulations like the TPLPs (Act 172) and promoting better environmental outcomes. Not having the standard could lead to inconsistent enforcement due to a lack of understanding of compliance, for instance, in how to correctly put up tree protection signage.

4. Conclusion

Through content analysis of websites and documents owned by LPAs in the UK and Australia, this study has gathered several good practices by the LPAs in implementing TPLPs for construction projects. This benchmarking method has enabled the study to propose these good practices as potential CSFs in the *Framework of Effective TPLP (Act 172) Implementation for Construction Projects* that the authors have developed. Due to the qualitative research approach, this study might have its own limitations, such as the findings are less generalizable and prone to bias because the sample sizes were not large. Moreover, there were also possibilities that this study has missed some perceived SFs due to inexact keywords used during searching and reviewing for the information. Hence, the next stage of this research would be to introduce the SFs for discussion and verification by the stakeholders (e.g., LPAs, PLANMalaysia, and construction industry) through various research methods such as focus group discussions, questionnaires, expert interviews, and content analysis of Malaysian LPAs websites and documents. Hopefully, we may be able to identify the actual CSFs to deal with so that each can be integrated into the stakeholders' strategic management and execution processes to ensure that TPLP (Act 172) are effectively implemented for the benefits of both the Malaysian construction industry and the environment sustainability.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Nik Adlin Nik Mohamed Sukri, Zulhabri Ismail; **data collection:** Nik Adlin Nik Mohamed Sukri; **analysis and interpretation of results:** Nik Adlin Nik Mohamed Sukri, Zulhabri Ismail, Rumaizah Mohd Nordin, Wan Tarmeze Wan Ariffin; **draft manuscript preparation:** Nik Adlin Nik Mohamed Sukri, Zulhabri Ismail, Rumaizah Mohd Nordin, Wan Tarmeze Wan Ariffin. All authors reviewed the results and approved the final version of the manuscript.

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