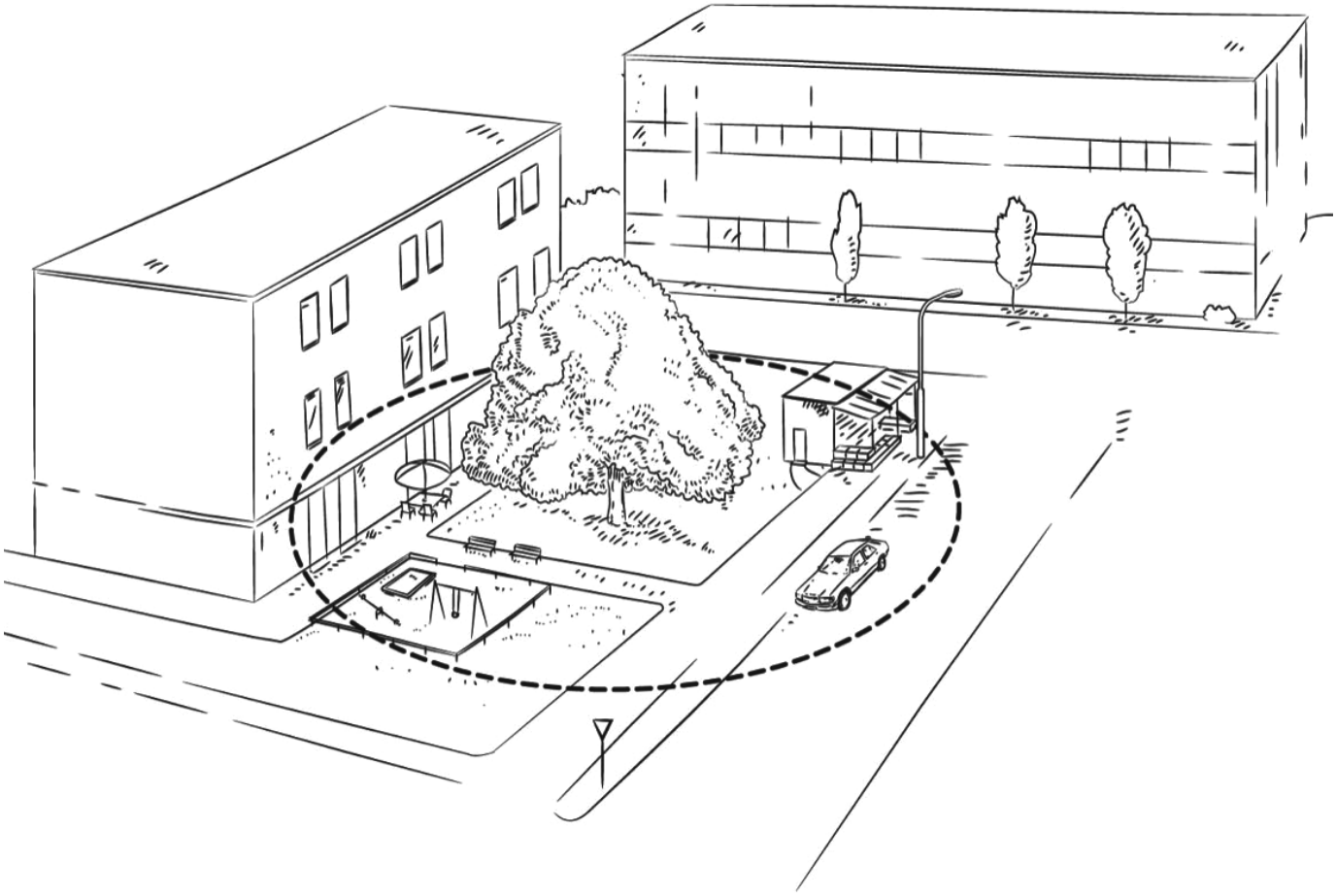
STANDARD

TREE INSPECTION AND DIAGNOSTICS



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Drzewa dla Zielonej Infrastruktury Europy

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Editors and main authors: Kamil Witkoś-Gnach, Mariusz Krynicki

Cooperation:
Beata Pachnowska, Marzena Suchocka, Jerzy Stolarczyk, Piotr Tyszko-Chmielowiec

Consultation:
Wojciech Bobek, Robert Głuszak, Michał Jasztal, Jakub Józefczuk, Julia Kończak, Bożena Kotońska, Łukasz Mielczarek, Ireneusz Mikoda, Łukasz Pająk, Ewa Partyka, Paweł Pawlaczyk, Łukasz Pawlik, Marek Piwowarski, Ewa Romanow-Pękal, Przemysław Szwałko, Krzysztof Wcisło, Aleksandra Zienkiewicz

Images: Jakub Józefczuk

Graphic design: Bart-Studio, kontakt@bart-studio.pl

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Wojewódzki Fundusz Ochrony Środowiska i Gospodarki Wodnej we Wrocławiu

Drzewa dla Zielonej Infrastruktury Europy

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1. Introduction

1.1. Justifying this Standard

Trees are key elements of green infrastructure and have a capacity to supply people with a wide range of benefits. As they grow and develop, they change structurally, in a manner potentially influencing their stability either as a whole or in part. Human activity may also give rise to unfavourable change in trees' functioning, again potentially posing a threat to the surroundings. Furthermore, trees may also "come into collision or conflict" with the lives of people living among them, inter alia given the presence of technical infrastructure (as when branches and leaves obscure road signs, when crowns of trees begin to overhang roads, when roots penetrate elements of infrastructure in the ground, and so on).

Those who own and manage trees need to take action to ensure that safety is maintained in the vicinity of those trees, even as they also work to improve the living conditions for the trees themselves. At the same time, the nature of the processes ongoing in trees combines with the unpredictable nature of atmospheric phenomena and human impacts to ensure that it will never be possible for people to maintain full safety in the vicinity of trees. But it is for this reason that part of the process by which we manage trees needs to involve a rational system of appraisal and evaluation.

For, in this context, the fact that the tree-management sector in Poland still lacks guidelines, standard practices and direct statutory regulation conspires to ensure that documentation on the state of trees which makes its appearance can differ greatly in quality from place to place and from one circumstance to another. Disparities of this kind can relate to both the level of detail and the substantive scope.

Yet reports drawn up in this context constitute a basis for important recommendations on how to proceed with trees. And – what is more – the recommendations in question sometimes look unnecessary, excessive or futile, or indeed seem actively harmful from the point of view of the tree. Indeed, there are cases in which both the bases upon which trees are assessed (provided by inspections) and specialised diagnostic decisions are made by people lacking the necessary knowledge or experience. In such cases, threats may be posed – certainly to the survival of trees, but also in fact to the safety of people and property, in particular where harmful actions end up being taken or else where there is a tendency to play down the significance of what has been diagnosed.

Beyond that, judicial and/or administrative proceedings involving trees may quite often feature "expert" opinions not in line with the latest knowledge concerning trees, with the result that court judgments and other decisions ultimately delivered may simply be flawed.

These kinds of shortfall when it comes to the current "state of the art" of tree assessment lead to errors of two main kinds. On the one hand, it is possible for a tree not posing a threat to be removed, or made subject to measures that are not justified of indicated – with the result that a positive impact on the environment is lost unnecessarily, or even that the level of threat posed to the surroundings is raised further. On the other hand, of course, there is the possibility that trees which do pose a threat are left in place, and with some or all of the appropriate measures never taken – the result again being to increase the risk of loss of life or impairment of health among people, as well as damage to property.

The identification and professional assessment of features whose presence in or on a tree (or in the surroundings) may increase the threat of falls or breakages; as followed by correct recommendations on how to proceed with a given tree or trees; and the suc-

cessful following of those recommendations, should allow for a reduction in the likelihood of accidents to the lowest reasonably achievable level. Furthermore, as recent years have seen trees perceived in a far more favourable light, the Standard presented here aims to work in support of these positive transformative processes, from the point of view of tree management.

The development and pursuit of a holistic system by which to manage risk in the vicinity of trees is something remaining beyond the scope of the present document. Equally, however, the means of assessing and appraising trees as proposed here does represent a key tool of rather fundamental importance and usefulness when it comes to the risk-management process overall.

1.2. The legal basis for this Standard

The introduction of a standard for tree inspection and diagnostics does not arise directly out of any legal provisions. Equally, procedures in many or most of the court judgments issued by reference (if not by direct reference) to provisions laid down in both Polish Civil and Criminal Law offer numerous indications that action in line with defined (standardised and standard-regulated) rules is wise and justified. It is a general principle relating to shared life in the community that underpins responsibility and liability for harm done (also) by trees, including as a consequence of neglect in ensuring that trees are maintained in a safe state. What arises out of that is a tenet that somebody who owns land is obliged to make every due effort (i.e. to ensure that there is no lack of action) when it comes to guaranteeing safety on the given property, where this also extends to the trees present on the land. Where inaction leads to a situation in which safety is in danger that is tantamount to non-permitted conduct. And the safety in question can be best assured where there are appropriate diagnostics applied to trees, inspections made, and action taken on the basis of results obtained.

It needs to be made clear that, while this is not deemed an imperative, the law referred to above does nevertheless denote the direct imposition on a given person of an obligation that steps be taken to ensure safety in the surroundings. All that suffices here is the existence of a dangerous situation justifying the obligation to safeguard against accidents. On the other hand, pursuit of due diligence in this kind of case can be indicated or confirmed where there are (and there is evidence of) regular checks on the state trees are in being carried out, with this also leading on to rational risk assessment and consequent decision-making to ensure threat removal or mitigation.

So relevant references to the rectitude of, and justification for, a Standard to be introduced in regard to tree inspection and diagnostics may be found in the judgments and decisions delivered by both common and administrative courts, the need pointed to here relating to experts delivering expert opinions in the given matters. Indeed, the issuing of a court decision or judgment denotes a requirement that facts be established in the context of the overall situation applying, and that in turn means the possession of (scientific, professional and branch) knowledge that is obviously of a more or less specialised nature.

Annex 1 (point 6.1.) offers a description of bases in Polish law relating to the application of standards in tree diagnostics.

1.3. The objectives of this Standard

This Standard has as its aim a gathering-together and presentation of principles applying to the assessment of trees, in line with the current state of knowledge and best practice. In this sense, it is a document that helps structure the possible procedures associated with assessment and evaluation, as well as offering relevant definitions. This further means that decision-making at various different levels can be facilitated, given the possibilities for identifying features influencing the safety situation around a tree. In turn, effective assessment serves as a basis for recommendations on what work to carry out on or around trees (where this also includes the possibility of passive maintenance of trees, albeit with care taken to ensure they remain in a good state). The ultimate consequence is each time a lowering or mitigation of the risk surrounding trees to a level that can be regarded as reasonable and acceptable.

Table 1. Indications as to assigned roles in the assessing of trees

OWNING OR MANAGING TREES	ASSESSING TREES	WORKING WITH TREES
• are obliged to maintain trees • define and communicate principles that will underpin tree assessment and management • define the level of need for trees to be checked out and monitored • determine the size and details of the relevant budget • delimit the area subject to inspection • determine the level of assessment • lay down the scope of any work done • determine the frequency with which assessments are to be made • establish which jobs or tasks are to have priority status	• (together with owners/ managers) develop and determine the scope of work, including as regards the time frame • identify conditions present in the areas around trees subject to inspection • assess conditions in the surroundings • assess and classify potential safety threats in the surroundings • assess and classify potential threats to the state and wellbeing of trees • carry out risk assessments • indicate if an advanced assessment is needed (and possibly also carry that out) • devise and develop plans of work • make recommendations as to the frequency with which further checks will need to be made • draw up reports and send them to clients	• ensure that services that have been commissioned are actually carried out, e.g.as regards: – pruning – felling – mechanical support systems – measures to improve the condition of trees – measures to improve site conditions – planting – replacement of trees • determine the need for further measures and treatments

Source: author's own elaboration based on ISA 2017

* Dunster, J. A., Smiley, E. T., Matheny, N. P., Lilly, S., & International Society of Arboriculture. (2017). Tree risk assessment manual.

1.4. Application to public procurement

The Standard can be applied in assessing trees in whose surroundings there is a requirement that the safety of human beings and their property should be assured. This applies first and foremost where trees are present in public space, including in areas of greenspace, in belts along public roads, and in situations where trees are present beyond areas of greenspace (not least where these are subject to one or other of the forms of protection referred to in Art. 6 of Poland's Nature Conservation Act, or relate to one of the forms by which monuments are protected, as referred to in Art. 7 of the Protection and Care of Monuments Act, or else are located in forest areas – and in particular those accessible to tourists).

The Standard may also be applied in situations of public procurement – as an element to the description of the subject of such a procurement. Application of the Standard may not be a condition for a Contractor's participation in procurement procedures, and nor may it constitute a criterion when it comes to the assessment of an offer. However, a commissioning party or Employer may require that work be carried out on the basis of a Standard indicated, in line with the way this can ensure quality in the pursuit of a commission. The Standard may thus be appended to the content of the so-called SIWZ (Specyfikacja Istotnych Warunków Zamówienia, i.e. the specification of key conditions that are to underpin a given procurement order), or a contract, given the status of these as documents by virtue of which we may appraise the pursuit of a task. Indeed, as effect is given to an order in public procurement, the only way of verifying compliance with conditions in applying a Standard is based on contract provisions relating to the official acceptance of work (or else resort to contractual penalties where given criteria set out by a Standard go unfulfilled).

Thus, where the present Standard does gain application in a public-procurement context, the description of the subject of a commission should at minimum lay down:

- a list of trees or areas that are to be assessed (in one way or another defined precisely),
- the level, scope and degree of precision of the assessment carried out,
- the means and methods of reporting results and conclusions,
- a timetable for the assessment to be conducted.

1.5. Limitations faced as trees are assessed

Given the degree of complexity that characterises both the structure and functioning of trees, as well as relevant natural processes (such as the development of a tree as a whole, even at the expense of dieback in certain of its branches), there is no possibility of full safety in their vicinity being guaranteed. Equally, accidents involving trees that give rise to more serious damage are actually very rare phenomena. It is typical for the damage done to trees under normal weather conditions to be predictable … and preventable, where consistent, professional assessment proves possible. However, every tree – whether showing signs of weakening or not – can sustain damage when extreme and exceptional external forces are involved (not least strong gusts of wind, heavy snowfall, and so on).

Equally, it may be that features characterising trees and/or their surroundings are simply impossible to confirm, and to assess adequately. Such limitations arise out of factors linking up with trees that remain unknown or even unknowable, involving features and traits, differences in ways the surroundings of a tree are utilised, the influence of habi-

tat and weather conditions on trees, and human activity. That said, as societies we are shown clearly as willing to accept a certain degree of risk – in this case in the face of the numerous benefits trees have to offer us.

It also needs to be recalled that we only take account of the current state of the tree at the moment the assessment is made, not considering changes and features occurring after that. Moreover, not all features and forms of damage can be noted and reported, and not all threats of collapse or breakage are foreseeable, inter alia because of the methods and tools applied in investigation, and in the collection and analysis of the data that constitute the assessment of a tree's state. By introducing a Standard, we help ensure that assessment extends to all important areas in use, while facilitating monitoring of the process by which the objectives of an assessment are pursued and achieved, and use made of them in decisions made and issued.

2. The tree assessment system

Assessments of trees prove valuable in risk assessment, i.a. as threats are identified and limited and mitigated (by virtue of the reported presence of characteristics capable of influencing the stability of whole trees or parts thereof, as well as the degree to which use can be made of land on which trees stand). Where a larger area of trees is under management, the stage at which a management system is introduced will need to be preceded by an area or site overview (that is not the assessment of trees per se). The purpose of this is to allow for the identification of areas featuring problem trees, with this (alongside an assessment of the intensity of land use) then allowing for the timetabling of individual tree assessments across the area administered.

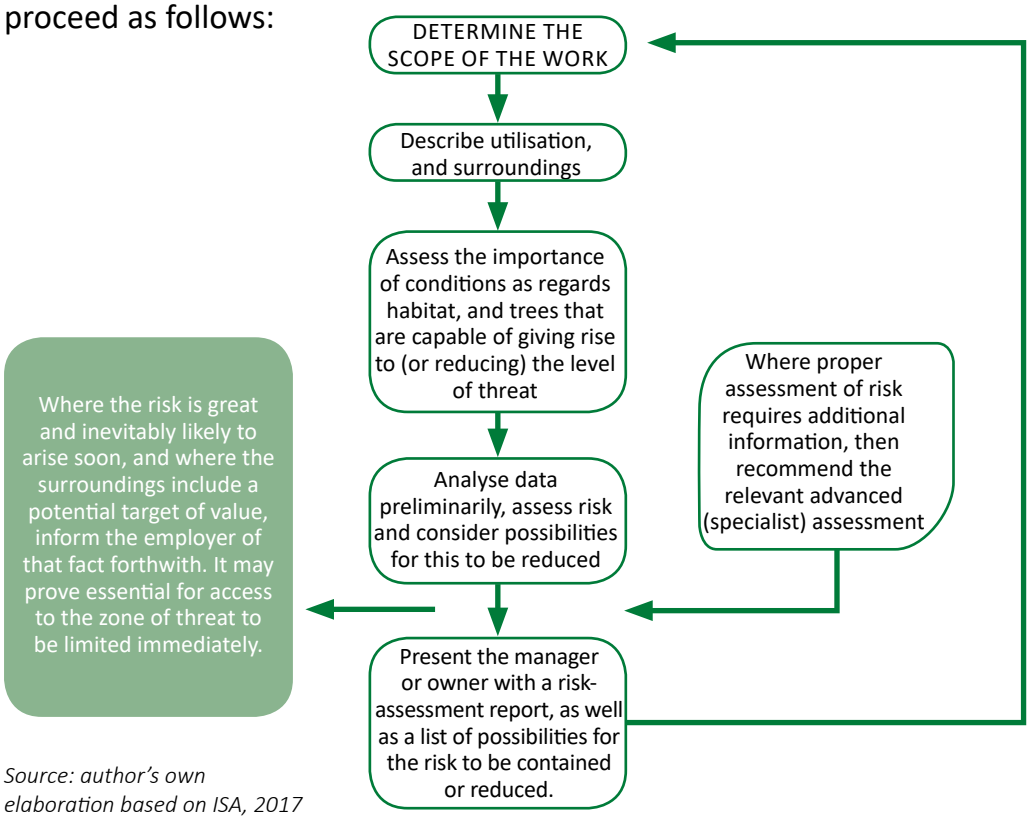
The assessment of trees as such should be carried out in a structured and systematised manner, and as documented appropriately. It is recommended that data be collected and stored in digital form, in order that later updating can take place efficiently. Of course, the preservation of data on paper (e.g. on an assessment form) is also permitted; while it is likewise essential for the assessment carried out to be documented photographically (see Point 7).

Assessments are done for each individual tree as a separate specimen. They should be pursued at different levels of detail and in line with need and the instruments used. Where the present Standard is concerned, a distinction is to be drawn between levels of assessment as follows:

- **the basic level of the tree inspection** (as described in detail in point 4),
- **the specialist assessment or investigation** (as described in detail in point 5).

Where the features of a given tree cannot be assessed properly within the framework of the basic assessment, the specialist version is then recommended. Where it proves possible to report a direct threat linked with traits or features of a tree (or its surroundings), then it is necessary to report this state of affairs to the manager or owner, irrespective of the type of assessment that has been conducted. Where the matter is seen as pressing or the threat grave, the State Fire Service will also need to be contacted.

Activities comprising the basic level of assessment (inspection) proceed as follows:



Source: author's own elaboration based on ISA, 2017

2.1. General principles in the assessment of trees

The assessment of trees entails three main stages to the collection and classification of data. The first stage is the gathering of basic information on a given tree that inter alia allows for its identification. Included here is the tree's location on a map and its marking in the field, a determination as to the species and measurement (in relation to circumference, height, crown diameter, height above ground of the crown base and height of the crown).

A detailed description of how such basic information is gathered (including via measurement) is supplied in points 2.2. and 6.3. (Annex 3). A further stage involves the identification of diagnostic features (i.a. as regards a tree's habit and structural features, also with regard to signs of damage and decay). Diagnostic features are described in detail under Points 2.3 and 6.2. (Annex 2). Where a detailed analysis of reported features or conditions in the surroundings and the habitat is deemed to be necessary, and where inspection alone cannot guarantee a proper assessment of these, it will then be necessary to recommend that a specialist assessment be carried out. This specialist assessment is described in detail under point 5.

2.2. Basic information on a tree (basic survey)

Such basic information also ensures that the trees involved may be identified. The scope of the information collected equates to the core scope of dendrological inventorying, comprising as that does the unambiguous determining and establishing of the location of a tree – which also has an identification protocol conferred upon it – in relation to determined species and measured dendrometric features.

2.2.1.A tree's location

It is recommended that trees subject to evaluation be marked on a map. The level of precision of the mapping involved here will reflect the need (purpose underlying the assessment), and the nature of guidelines issued. It is nevertheless imperative that the solutions applied should allow for the unambiguous locating and identification of the given individual tree in the field. Main forms of mapping could be master maps (the preferred option), satellite photographs, orthophotomaps or land-registry maps.

A tree is to be located on a map in line with principles as follows:

• the location of an individual tree on a map is signified with the aid of a point and defined coordinates. A further option (should this be commissioned) is to indicate crown spread on the ground ("projected area") – on the basis of the measurement indicated in point 6.3.6. (Annex 3).

• Each mapped tree is also identified by means of numbering that ensures uniqueness in regard to each specimen in the given area.

• Where a given tree is located within a contiguous stand of trees, on a slope, or in terrain whose conditions are difficult for other reasons, it is permissible (in agreement with the commissioning party) to designate or mark a group of trees, including young self-sown trees (whose dendrometric parameters are such that no permission for their removal in line with detailed legal provisions is required).

2.2.2. Species

As a matter of principle, a tree should be identified to the level of the species, though there can be justified cases (agreed with the commissioning party) in which a simplified identification to generic level only is applied, or else a more detailed one that includes subspecies or varieties. However, all entries of this kind should use names in line with the *International Code of Botanical Nomenclature*. Trees that cannot even be identified to the level of the genus, or that are not recognised by the Code, are to be described as "unknown". It is permitted for a Latin name to be used without the abbreviated version of the name of the person who first described the species.

2.2.3. Marking trees in the field

It is recommended that identifying markers be used to provide for unambiguous fixing of a tree's location in the field. Unique marking should be supplied to trees using markers, with numbering identical to that present through mapping. A marker may be installed using a single pin or nail, with this driven into the wood to such a depth that permits further growth in girth of the tree (at least 4 cm is recommended). Applying a similar principle, it is recommended that young trees only be marked in a short-term fashion, with labels fixed to the bark, or with some kind of band either around the bark or attached to the stakes driven into the ground that help stabilise a newly-planted sapling. Marking should be carried out at a height 2–2.5 m above the ground, in order that reading off of the details remains relatively straightforward, even as deliberate vandalism is made less easy to achieve. A marker should be permanent, its content readable and weather-resistant. Marking of a tree with permanent paint should be done only in the cases of trees whose removal has already received the green light

2.2.4. Tree measurements

Dendrometric parameters and features that gain application are trunk girth or circumference; breast-height diameter; tree height; height of the tree crown in relation to lowest-lying point of attachment; the height above ground of the crown base (crown base height); crown diameter and crown height (sometimes also known as crown length). A detailed description of the dendrometric measurements to be taken is as set out in Section 6.3 (Annex 3).

2.3. Diagnostic features

This Standard applies the term *diagnostic feature* in relation to a tree, where this is seen to be distinct from the notion of the *defect* used by those whose job it is to assess or evaluate *wood* from the point of view of its quality. This reflects the way in which many defects in wood are natural features that influence the suitability of wood for given economic uses, but may be of no significance when it comes to the condition of the tree as such, or its stability.

A diagnostic feature is one that may indeed attest to damage or decay, but also relate to the habit of the tree or the conditions on the site where it is growing. By definition, though, a feature of this kind supplies information of importance in regard to a tree's stability and condition.

Typical diagnostic features are as listed under point 6.2. (Annex 2). Tree inspection (the basic assessment) sees diagnostic features identified, but also assessed visually. Basic equipment like a sounding mallet or tree-inspection probe may help with assessment, while in a few cases it may be necessary to resort to specialist methods, including the instrument-based diagnostics that come within the context of the specialist assessment, and provide for a correct assessment of reported features' significance where the stability of a tree is concerne

3. The site overview

3.1. General principles

The practice of the site overview may be applied in justified cases, where there is a larger area under management for which risk-management planning demands decisions as to the order in which areas will be subject to assessment at the level of the individual tree. The practice is also indicated in the context of the ongoing review process required for example along roads, or else in exceptional circumstances (such as when a severe storm has passed through an area).

Given these contexts, an overview of this kind does not represent a distinct tier or level of assessment of trees, but should rather be seen as work of an additional or supplementary character when it comes to the look taken at trees under the management system devoted to them.

3.2. The place in which a site overview is carried out

The area subject to an overview is not one in which all the trees are assessed, being instead confined to those within the sight of the person doing the review work. An area of this profile might be a park that is being assessed by people who walk down avenues of trees; a site with trees through which a road runs, and so on. Where remote sensing methods are applied, the subject of the assessment will be the entire area designated, along with all the trees that grow within it (meaning also those to which access is limited or in some way made difficult).

It is typical and useful for each area subject to an overview to be uniform in some sense, at least in terms of function served, level and type of use made and intensity of maintenance. Where a given area (e.g. the aforementioned example of a park) is somehow zoned in the sense of being utilised to differing degrees or serving distinct functions, that would serve as an indication that these zones should be treated as separate areas for overview, with the record-keeping likewise being distinct. Analysis at a distance ought to allow for reliable assessment from the point of view of the occurrence of obvious diagnostic features (in line with the simplified visual method).

3.3. How a site overview is conducted

In the course of the overview, note is taken of obvious diagnostic features, which are also the subject of analyses conducted. The features in question are thus those that can be reported on by way of observation, with no resort to diagnostic tools or instruments. This in turn denotes that they are obvious and unambiguous enough to offer a basis for saying what state a tree is in, and what threat to its surroundings it might pose. A further role is of course to provide for the selection and planning of appropriate measures seeking to ensure the maintenance (i.e. also the continued existence) of the tree, even as the work done minimises the degree of threat posed to and in the surroundings. This on the other hand denotes features obvious enough that they may be identified by people with just a basic (i.e. limited) knowledge in the relevant field of tree assessment. Such a person might therefore be the one administering the site, given that person's likely familiarity with the trees concerned – to the extent that changes occurring in a given tree and in its surroundings might prove noticeable.

The overview is thus a visual reconnaissance of a tree or group of trees from a defined viewpoint or perspective (at ground level – from some kind of pathway or route through the area; or from the air using a drone; or by way of laser scanning; or via hyperspectral imaging in a remote-sensing context). Trees can be driven or walked through on one side or on several, while in selected cases the specifications for the work may require that given trees are viewed from all sides. The assessment is performed to provide for the identification of obvious diagnosable features that can indicate a direct threat posed to people and/or property.

3.4. The scope of a site overview

The aim here is to achieve a generalised assessment of the stability of trees in the given area, as well as the level or intensity of use being made of a particular site. Stability of trees in this meaning is evaluated by reference to the main or prevalent or typical state trees are found to be in. Where it proves possible to note trees with obvious characteristics indicating problem status (loss of stability of the entire tree or a part of it), it will at minimum be necessary to identify that tree and pinpoint its location, to describe any features taken as indicating that stability has been or will be lost by the whole tree or a part of it; the scope of any work that should be carried out; and further information on any priorities where that work is concerned. The site overview may optionally be extended to include further data, such as species, girth measurements, and extra information on the locations of problem trees. And where such problem trees pose a direct threat to people or property, it will be necessary to ensure absolutely and irrespectively of other issues that there is remedial action in the face of the real and present threat.

3.5. The timing of site overviews

A site overview is carried out in line with the need. It can be done at given intervals within the framework of a periodic site review, or it can be of an extraordinary nature, unplanned – e.g. if especially unfavourable weather conditions have arisen recently. Where remote sensing is used to achieve the goal it is imperative that the data should be obtained when the trees are fully in leaf (best of all in the month of August).

3.6. Overview outcomes

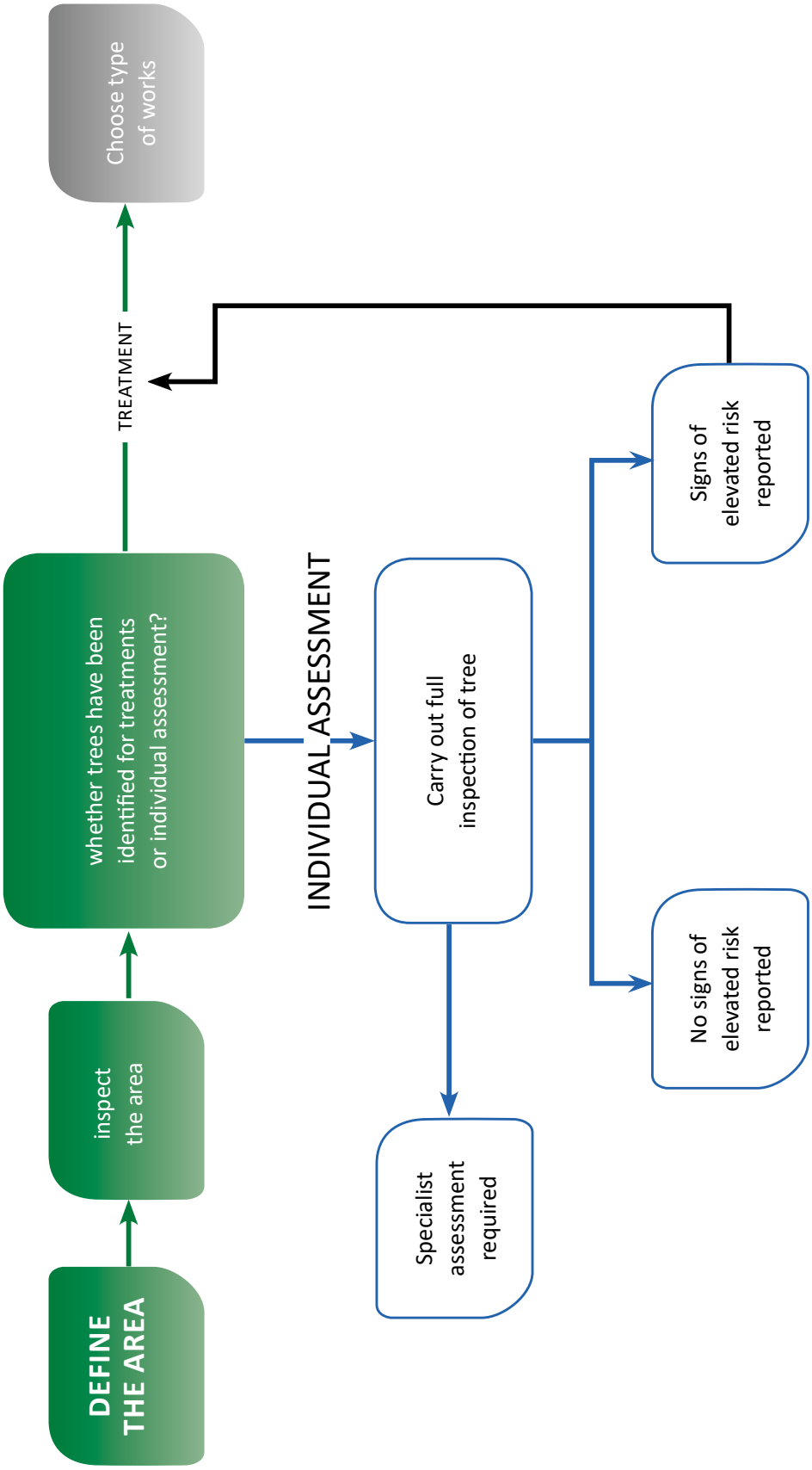
On the basis of a site overview carried out, it will be possible to point to:

- trees in need of immediate attention,
- trees needing to be assessed individually,
- areas in which individual assessments will need to be carried out in a defined order,
- trees incompatible with infrastructure that is present.

3.7. Conditions underpinning a site overview

A site overview is not backed up by diagnostic equipment. It is rather a basic method by which – above all – to identify problem areas and threats in the vicinity of trees. It may be carried out by people who have no more than basic skill, though a proviso would tend to be that the person is familiar with the area – in that way being in a position to note any more major changes taking place in the stand.

The simplified method is also of course the most rapid one, even as it is the least precise. There is a justification for it to be applied where a repeat assessment is taking place in a given area with a group of trees, or alongside a repeat process of tree inspection where a timetable for that has been established, or following on from periods of extreme weather (such as gales, storms or severe instances of hoar frost).



4. The tree inspection as the basic assessment

4.1. General principles

The tree inspection is a task of fundamental significance that aids in risk management in the vicinity of trees. The main method deployed here is again visual inspection of trees done from ground level. It is required that the person doing the assessment should pursue it from as many sides and angles as possible. Furthermore, this is an assessment that encompasses the area around a tree, as well as all the parts of the tree itself. Non-sophisticated equipment like binoculars, a probe and a mallet may be deployed in this case. It is thanks to an inspection of this kind that a tree may be selected and made subject to appropriate maintenance measures. Where the basic assessment does not suffice (when it comes to relevant features and traits being evaluated), it will be necessary for a specialist assessment to be commissioned.

4.2. The scope of an inspection

The parameters and features to be addressed in the tree inspection have been identified and elaborated upon in line with the current state of knowledge and best practices. To optimise gathered data in terms of their quality it is recommended that the features referred to below should be taken account of. However, the scope actually considered in the course of the inspection of a given tree is first and foremost of matter of what has been commissioned. A full-scope inspection is one comprising basic information on a tree (see 2.2.), an assessment of diagnostic features reported (see 2.3.), and an assessment of remaining parameters and features (see 4.2.1.– 4.2.7.)

4.2.1. The intensity and level of use made of the surroundings

The intensity and level of use of a tree's surroundings is determined in line with the probability that people and/or their property will be present in the area should a tree or part of a tree fall. The distance from the trunk that determines the area assessed is equivalent to 1.5 times the height of the tree (more if the inclination of the land demands that), with the possibility considered therefore being that part of the tree will break off, or that the entire tree will be uprooted. Where the issue is the threat that a part of a tree (like a bough or branch) will break and fall, the distance taken into account is given by a radius twice the length of that. Detailed guidelines for the classification of kinds of use made of the surroundings are as included under point 6.10 (Annex 10).

4.2.2. A tree's phase of development

This is characterised in terms of the phase of ontogenetic development the given tree is found to be in. Certain diagnostic features and the significance to be attached to them (influence on the state of the tree) will be correlated with the phase of development, hence the way in which an assignment to a given phase allows for a verification of a tree's overall state, as well as an assessment of its regenerative capacity.
In line with the Standard, the three main phases of development identified involve young, mature and ancient trees.
However, where there is justification in line with the needs of tree management, it is possible to distinguish further phases – especially where young trees are concerned (for example in the direction of "newly-planted" or "maturing" young trees). A detailed description of the situation in this case is offered under point 6.4. (Annex 4).

4.2.3. Vitality

The assessment of vitality is based on a visual analysis of crown structure, and serves in the assessment of a tree's capacity to go on living (but also to develop and grow and regenerate). The key manifestation is in crown structure (and stem growth).

The vitality assessment is independent of that involving stability, while it is a component part of the assessment of condition. A modified Roloff Scale has been adopted in assessing vitality, with both the numbering and names used for vitality changed. To ensure consistency with the digital system of assessing trees, values between 1 and 5 have been adopted under this Standard (as a "0" designation ought not to be applied in electronic databases).

Given that different parts of the same tree may display differentiated vitality, the principle applied involves assessment of the upper third of the tree crown. It is also necessary for vitality to be understood in the context of a tree's development – a healthy young tree would typically present a value of 1 (i.e. 0 on the Roloff Scale), while a maturing tree is awarded a 2 (1), and a mature tree a 3 (2). Ancient trees have non-specific features where the Roloff Scale is concerned, such that, where a detailed diagnostic is concerned, different parts of a crown may require separate vitality assessments.

Offshoot stems are usually characterised by a situation qualifying for a 2 (Roloff 1), irrespective of the tree's overall vitality, hence a tendency to avoid these if a general assessment is being carried out.

A detailed description of vitality in trees is to be found under point 6.5. (Annex 5).

4.2.4. Condition

The condition a tree is in is a reference to its capacity to sustain life processes in their proper form, including through compensation for damage incurred and other negative influences imposed by the animate and inanimate environment. A tree's reaction to damage is not assessed in regard to its stability, but rather defines the influence that damage does to health status. Condition is thus determined by taking account of:

Kondycję określamy, biorąc pod uwagę m.in.:

- the state of the assimilatory apparatus (mainly the foliage),
- reactions to damage,
- the influence and scope of damage on a tree's life processes overall (though as not considering the matter of the tree's stability),
- the assessed significance of diseases and pathogens,
- an assessment of vitality/vigour in the context of a tree's phase of development (4.2.3. and Annex 6.5.).

A tree's condition is defined on a five-point scale:
1 – very good
2 – good
3 – poor
4 – very poor
5 – critical (denoting a tree that requires urgent intervention)

Details as to how to describe the condition a tree is found to be in are as offered in point 6.6. (Annex 6).

4.2.5. Stability

Reference to the feature of stability ultimately denotes the likelihood that a tree or part of a tree will fall or break off. Assessments thus take into consideration splits or decay affecting roots, trunks, boughs or branches, but also the habit of the tree overall, the surroundings, and defensive and compensatory reactions and responses that trees may have mounted at different times. There is no necessary correlation between the stability of a tree and its condition overall or state of health. To put it another way, a tree that has sustained rather little damage influencing it's health may still be unstable, while a stable tree might be in poor condition. This is suf-

ficient explanation for the theory and practice of parameters relating to condition on the one hand and stability on the other being kept separate and made subject to separate assessment.

Visual assessments take account of the probability of a break taking place, or of a tree being thrown by the wind (or possibly falling through the operation of other factors). This is achieved by reference to symptoms that are visible to the eye.

The five-point scale applied to stability encompasses:
1 – very good
2 – good
3 – impaired
4 – much impaired
5 – critical state (in the case of a tree requiring urgent intervention)

Detailed descriptive material on the stability of trees is as provided under point 6.7. (Annex 7).

4.2.6. The perspective as regards a tree's persistence and maintenance

Assessment of a tree's further development entails anticipation of the time perspective over which that tree will be in a position to keep up its core life-processes (i.e. photosynthesis, the transfer of assimilates in nutrition, and the conducting of water) in a manner that continues to allow for optimal development at the given age. The assessment is made by reference to the tree's observed condition (including vitality in the context of phase of development), as well as its stability. The time perspective over which the tree is to remain or be maintained or sustained is defined by reference to the following scale as:
A – long-term
B – short-term
C – characterised by zero prospects.

The detailed description of prospects for a tree to be retained is as provided for under point 6.8 (Annex 8).

4.2.7. Assessment of particular diagnostic features

In relation to the level and type of assessment, it is possible to recommend all the reported features of a tree capable of attesting to its condition and or degree of stability.

The assessment of these features is in particular indicated where the parameters for stability of a tree and condition of a tree achieve levels of 3 or above. It is recommended that particular features should have values ascribed to them, or else that a detailed description should be applied. Where the definition is associated with assigned values, a feature is assessed in line with the following scale as:
1 – non-significant
2 – moderate
3 – serious
4 – critical

A detailed description of the scale as it applies to particular diagnostic features is as set out in point 6.11 (Annex 11).

4.3. Timings of inspections

Different diagnostic features are perceptible in different seasons of the year. For example, damage to crowns and the upper parts of tree-trunks is more visible when leaves are lacking, while foliage (density, leaf-sizes and damage) is obviously possible to assess when leaves are present. Fruiting bodies of many fungi appear just once a year – mainly in late summer or autumn. Again fairly obviously it is not recommended that inspec-

tions should be made when there is a cover of snow (observations of certain features are made difficult), or frost (which precludes the use of a probe), or heavy rain or snow or strong wind.

Furthermore, the timetabling of assessment work should take account of rhythms characterising the activity of protected species occurring or likely to occur at a given site.

In any case, the timing of an inspection has the capacity to influence the precision with which species of tree under assessment are identified. Deciduous trees assessed in a leafless state may give rise to doubtful identifications to the species level, suggesting a need to return when foliage is present (or else the flowers or fruit that can often also allow for proper determinations).

There is thus a useful suggestion that successive inspections might be carried out in different quarters of the year, in order to ensure that more than one season is represented as work is done.

4.4. Assessment intervals

Tree inspections should be carried out cyclically in line with defined intervals. Typically these might be of between 1 and 5 years. Presented below are recommended intervals for assessments in different cases:

- where trees *have not* been found to have features or attributes capable of influencing the stability of the specimen as a whole or part thereof – every 3 years or so;
- where trees *have* been found to have features or attributes capable of influencing the stability of the specimen as a whole or part thereof – after intervals of between half a year and two years, in line with indications arising out of the assessment carried out.

Young trees are monitored and assessed as part of the after-care following planting, only to be assessed later from the point of the forming of their crowns, where they are present in close proximity to items of infrastructure (see the Standard – Tree Pruning and Care).

4.5. Tools and instruments used in inspection

As a tree inspection is being carried out, it is recommended that simple instruments should be used to enhanced knowledge of the given tree and potential diagnostic features. It is *not* compulsory for this to happen, except where this a requirement given the specific nature of the task to be carried out. Key examples of the equipment, tools or instruments used in inspections would be as follows:

- **binoculars** – which are used to inspect the upper parts of tree crowns, to pinpoint any holes and fungal fruiting bodies, scars, cracks and signs of damage, birds' nests, splits, examples of improper branching and other diagnostic features not readily perceived from ground level.
- **a diagnostic mallet** – which is used to assess a tree with a view to identifying areas of a trunk or bough that are scarred or otherwise damaged internally, undergoing decay or experiencing detachment of the bark. The trunk or branch is hit or knocked with the tool (which is typically of rubber, or also of wood), with a flat surface and very limited capacity to do damage. The person doing the tapping will listen for differences in pitch in order to identify areas that have sustained damage of one kind or another.
- **a tree-inspection or tree-decay probe** is a stiff rod with a handle used to investigate the presence and extent of tissue decay in different parts of a tree.

4.6. The outcome of an inspection

The assessment serves to point to trees which, in line with the features and characteristics reported for them, are capable of exerting an influence on the stability of a whole specimen or part thereof; as well as the level of use that can be made of the tree's surroundings. A key further part of that is the indication regarding intervention or else further (specialised) assessment that may be required. Thanks to an assessment, it is possible to suggest or indicate appropriate measures linked to tree maintenance and serving further optimised development, as well as the upholding of safety requirements in the vicinity. Equally, where the above assessment of tree features or land use fail to indicate any threat to safety, the assessment then serves to indicate those trees over which no further action need be taken. Each time, irrespective of the type of assessment being made, the date of the next tree inspection needs to be given.
Obvious diagnostic features always need indicating in a completed assessment of a tree.
Where the assessment is of features of stability, a value of at least 3 needs to be assigned to any and all such recorded features that are capable of influencing the stability of a tree (or part thereof). Likewise, a clear recommendation is possible in respect of all reported features able to exert this kind of influence, irrespective of the assessed state the tree is considered to be in overall – and in relation to each reported level assigned to stability features.

4.7. Recommendations arising out of an inspection

Where a tree inspection has been carried out and is associated with a requirement that work should be done, public safety and further maintenance measures are best safeguarded if recommendations reveal the technology whose use is indicated, the level of urgency of measures, and any possibility cyclicity (where a measure needs to be taken more than once). This can be done in line with the principles described in the sections that follow.

4.7.1. Type of work

The choice of technology (type of intervention) can take in a wide range of measures involving the crown (such as cutting, tending, tying, etc.), with indications as to future (specialist) testing also offered. This is expressed in words or in line with the nomenclature applied in the **Standard – Tree Pruning and Care**[1]. It is also possible for non-standard technological procedures to be introduced, on condition that these are described in detail, in a manner than allows them to be applied, and later assessed and verified.

4.7.2. Urgency

It is essential that levels of priority and urgency should be assigned to different measures, in the interests of optional management and more flexible budgeting. All proposed measures can be categorised in line with different levels of urgency, as associated with significance.
The urgency with which measures need to be taken may depend on the level of threat reported. Timetabling might be:

1 – immediate	measures needing to be taken without delay (immediately, forthwith)
2 – very urgent	to be carried out within 1–3 months
3 – moderately urgent	to be carried out within 3–12 months
4 – non-urgent	to be carried out within 6–24 months

[1] Standard – Tree Pruning and Care, Wrocław: Fundacja EkoRozwoju, 2021.

4.7.3. Cyclicity

Where this is justified, each reference to a technological intervention or measure can be accompanied by information on how soon this might be repeated or reapplied. Reference to repeat measures should above all be made when it comes to practices like pruning to achieve specific shapes, or inspections of binding.

However, prior to engagement in any planned repeat measure, there is a need to check once again if this is justified.

4.8. Associated organisms

During the process of assessment it will be necessary to take into account the presence of protected and other valuable species, as well as the influence on them that any work ultimately carried out would have. This approach is of particular importance in the case of old and over-mature trees, as well as others that give the impression of being of enhanced natural value for whatever reason (such as on account of the presence of holes and cavities, areas of decay, and so on).

Beyond that, there is also a need to refer to any occurring tree-decaying fungi, parasitic or hemiparasitic fungi or plants, other types of disease and disease-causing pathogens and accompanying organisms. The types found should be recorded, as should their places of occurrence.

The presence of organisms associated with trees needs to be taken note of in assessment documentation, with particular reference being made to the presence of:

- birds and mammals (especially bats), as well as invertebrates (notably insects),
- nests and holes,
- nesting boxes for birds and mammals (including bats),
- feeding sites and/or other indications of the presence of insects, such as characteristic remains (allowing for identification to the level of the species or at least the genus),
- areas of damage and scarring,
- plants (including bryophytes) and lichens,
- the fruiting bodies of fungi and other specific signs of the presence of fungal species (such as rhizomorphs).

In particular, there is a need to make note of any protected species that are encountered and identified.

As the presence of accompanying organisms is reported on, note is taken of:

- the name of the species (or genus if only that proves possible),
- the location at which the organism (or feature suggesting its presence like faeces and characteristic wood residues) occurs,
- the characteristics of the occurrence,
- the date of observation.

4.9. Photographic documentation

Within the framework of an inspection carried out it is necessary for photographic documentation to be assembled. This should take the whole of the tree into account (thereby also conveying its typical habit), while also showing such details as the main diagnostic features, signs of the presence of protected species, characteristic elements, and possibilities of trees coming into conflict or collision with items of infrastructure or other important elements in the surroundings and therefore influencing the threat assessment.

5. Specialist assessment

5.1. General principles

The specialist assessment of trees is by definition an expert matter. This is thanks to the way it addresses conditions in the surroundings capable of influencing a tree's stability and condition. It is recommended for a specialist assessment to be preceded by a basic assessment in the form of a tree inspection. As the name would imply, it is usual for a specialist assessment to entail the use of specialist equipment and/or methods. The choice of methods of assessment and diagnostic tools should be adjusted to the scope of the assessment and the specific nature of the features to be assessed. A specialist assessment provides a basis for the selection and planning of appropriate measures to maintain the tree itself, as well as safety in its vicinity. It is also possible for original recommendations to be modified on the basis of inspections, with this providing a basis for further decisions and actions.

5.2. The scope of assessment and choice of methods

To select an appropriate specialist-assessment method (or set of methods), it is essential that the person responsible be in possession of knowledge of the ways in which different methods and instruments work, as well as their possibilities, limitations, strong and weak points. Specialist inspection might *inter alia* encompass:

- a detailed visual assessment,
- aerial inspection,
- instrument-based diagnostics,
- a detailed assessment in relation to site type, including as regards soil,
- specialist research into co-occurring species,
- biomechanical analysis, and hence an assessment of a tree's stability,
- tree valuation,
- phytopathological (including mycological) study.

A specialist assessment should be written up in a report. Measurements made and analyses carried out require documentation, and it is important that the record made of assessment results should make further verification possible at some later date. From this point of view, it is also important that equipment, instruments and tools should be standardised (and certified as such).

It further needs to be recalled that different diagnostic instruments (including devices used to calculate so-called safety coefficients) have their limitations and serve different purposes when it comes to assessment. Loading tests do not reveal wood decay along the trunk, while resistance drilling and tomography fail to reveal problems as regards rooting statics (a tree's vulnerability to being uprooted).

5.2.1. Specialist visual assessment

The specialist visual assessment entails detailed analysis and evaluation of a tree or parts of a tree, using basic diagnostic equipment (including a mallet, a probe, a core-borer, an endoscope, and so on). Such an assessment may also encompass results and interpretations arising out of additional calculations and simulations. The main difference between a visu-

al inspection and a specialist assessment also achieved visually is that the former takes less time and is more generalised. There is furthermore a difference in the level of competence anticipated for and required by those who carry out the given procedures. The specialist assessment of a tree is the sole preserve of people who are experts in this specific field.

5.2.2. The aerial inspection

An aerial inspection involves assessment of the upper parts of a tree, which are inaccessible and/or invisible from ground level (by definition any assessment of a crown of a tree that can be achieved for ground level, e.g. by using binoculars, may not be regarded as a specialist crown inspection). Thus, the kind of inspection of tree crowns being referred to here involves access by way of secured ropes, lifts or ladders (with relevant H&S principles applied in each case). It is clear that the climbing of a tree on ropes provides for the most incisive possible assessment, from within the crown itself. A visual assessment is then carried out, though simple equipment might also be used. In the course of the assessment, special attention is paid to diagnostic features: any weakening of major branching points; the presence of decay, holes, cavities, splits or fissures; and any situation in which parts of a tree have become overgrown, for example by mistletoe or ivy. The visual assessment of a tree-crown may not always suffice, it then for example being necessary and justified to do additional testing, e.g. with a view to determining how widespread wood-decay might be (even by using a tomograph or by resistance-drilling. Samples may be taken for further analysis, or their might be detailed analysis of incremental stem growth, and so on.

5.2.3. Instrument-based diagnostics

Various different instruments gain use in the assessment of trees, given the possibility of additional information being obtained to increase the level of assurance provided by the diagnosis. The techniques made use of commonly include the aforementioned tomography and resistance drilling, as well as tensometric and other kinds of testing. In this context, it needs to be recalled that the results from measurement will not by themselves provide for an assessment of the safety situation in the vicinity of a tree. The latter goal can only in fact be achieved where data obtained receive expert interpretation.

The invasive diagnostic methods making use of instruments should only be resorted to where assessment is not possible in other ways.

All the results of calculations should be presented in such a way that verification remains possible.

The listing of diagnostic instruments and tools as follows is not exhaustive, and only in fact extends to the most widespread and readily available methods.

5.2.3.1. Static load testing

Static load testing (involving so-called winching or pulling tests) allows data to be obtained in regard to a tree's stability in the ground, as well as the resistance of the trunk to breakage. Testing takes place via three main stages: wind-load analysis, the making of measurements and the interpretation of data obtained. In the context of analysis, it is the forces potentially acting upon the tree that are determined, and to achieve this it is typical for photographs to be combined with parameters collected in regard to the tree that are needed to calculate the forces impacting upon it (e.g. at the crown apex and centre of wind pressure). The second – measurement – stage entails simulated loading of the tree (using a line stretched between the trunk and an anchor point and a winch).The third stage involves the performance of calculations based on the data obtained, plus expert analysis of results.

The work requires the deployment of specific measuring equipment, i.e. inclinometers accurate to 0.01 degree at least, elastometers accurate to 0.001 mm at least and a dynamometer (force-meter). The testing methodology adapted and decisions as regard the

placing of the inclinometers and elastometers are dependent on features reported for the tree, and possibilities for correct mounting. The inclinometers operate in such a way as to test for the inclination of the root mass, so these should be mounted close to the trunk base. However, inclinometers should not be placed where the wood remaining wall is thin, in order to prevent any distortion of the test as a result of deformation of the wood at the trunk base during the time of the procedure. Elastometers are mounted on the trunk on the side of compression or extension to measure distortion of (strain imposed on) wood fibres. A standard measurement involving elastometers should not involve them being mounted where there are splits or open wounds or large cracks. The dynamometer is used to measure the testing strength.

Testing must operate within the limits of flexibility of the tree, as inter alia set out in the so-called Stuttgart Catalogue of properties (in this case as regards the resistance of a trunk to breakage). The limit value for inclination in line with this research method is 0.25 degrees, so if this value is reached the testing needs to cease. The key point of reference where inclination is concerned is the tipping curve. Load testing is not used to measure individual branches or limbs, or to determine the extent of areas with flaws along trunks, or to determine the extent of a root system.

5.2.3.1. The increment borer

This instrument allows for the collection of a sample from the interior of a tree. This can serve in mycological examination, as well as being used to determine the thickness of the healthy wood, the widths of annual growth increments in tree rings and the thickness of areas of decayed wood.

Where such a measurement is made on a living tree, this results in harm being done to that tree. To limit this harm, parts of the tree to be sampled should be determined in detail as a preliminary investigation is being carried out – e.g. by tapping a target area of the tree with a diagnostic mallet. An increment borer may be used to verify results obtained on a tomograph, with checks carried out regarding the real thickness of the thinnest wood of a healthy tree (or else parts of a tomogram that raise doubts).

5.2.3.2. The acoustic tomograph

This method is based on the measurement of a series of speeds at which sound passes through the wood of a tree. This is achieved with specially-designed soundwave sensors that need to be hammered into the wood (penetration only as far as the bark will distort results). It is typical for this kind of testing to feature between 6 and 12 sensors, with the information gathered fed into a computer program that generates a tomogram (image of the cross-section under study).

The method may be used to assess decay in wood, as well as scarring and other kinds of damage along a trunk or branch. A limitation is the way in which reference to the speed of travel of soundwaves ensures that any kind of obstacle or obstruction can distort the picture, whether this is a flaw or split, an overgrown old branch, a root fold, or whatever. Moisture in wood may also affect the result obtained. Particular attention needs to be paid where an irregular shape is being dealt with – in that case, for the result to be reliable, a precise measurement of the distance between sensors will be needed. Resistance drilling can be used to confirm the result obtained from a tomogram.

However, a tomogram does not offer a basis for any determination of a trunk's resistance to breakage. To that end, further (expert) analysis will need to be carried out, e.g. through the calculation of safety factor.

5.2.3.3. Resistance drilling

This method entails measurement of the resistance wood offers as it is drilled with a narrow bit (usually of diameter 3.5 mm). This allows differences in the density of wood to be identified, and hence changes associated with decay or other factors. Measurement achieved in this way does not take very long, but has its limitations, given that the

result is entirely related to the particular part of the tree tested, making it impossible and inappropriate to draw conclusions about the tree as a whole. The use of the drill can be justified in order to verify testing done previously, e.g. using a tomograph. But where this measure is pursued in relation to living wood there is obviously some damage caused, albeit less than with a core-borer. Various kinds of resistance-recording drill are now available, with these differing, not only in appearance and ergonomic features, but also as regards the principle by which the reading is achieved, the level of precision and the way in which data are recorded.

5.3. The level of competence assumed for those carrying out specialist assessments

A specialist assessment may be carried out by competent individuals with the appropriate skill and knowledge updated in the context of refresher training. The competences required in specialist assessment go far wider in terms of knowledge and skills than do those in the basic assessment, for example including:

- far-reaching knowledge of trees (their physiology, morphology, anatomy, biomechanics and ecology),
- the skill to make use of particular tools, instruments and kinds of equipment in line with the instructions and standard guidelines, and in full recognition of their possibilities and limitations,
- the skill to analyse results obtained,
- the skill to prepare necessary reports and documentation from assessments carried out.

Anybody whose duties ensure a responsibility for assessing trees and safety in their vicinity who does not have the requisite specialist knowledge is under an obligation to pass the task on to a competent person.

5.4. Assessment results and further procedure

Once tree diagnostics have been engaged in, it will be necessary to determine whether further steps need to be taken to safeguard the area in the vicinity of given trees. If a safety threat is found to be posed, then it will be necessary to point to such action as will operate to limit that threat. **Recommendations based on studies and expert analysis carried out ought to contain information on the further procedure, including the type of work involved, the degree to which that is urgent and any possible cyclicity characterising it** (as where work to reduce the size of a tree crown needs to be done in several separate stages).

5.5. Documentation

Once tree diagnostics have been completed, there will be a need to draw up legible and comprehensible documentation *inter alia* containing: basic information on each tree, a description of methods used and tests and studies carried out, obtained results, the final assessment, photographic documentation of the tree itself and tests done, and recommendations as regards further action. The documentation in question should also offer information as regards the author, place and date of any work carried out, and of the documentation itself.

6. Annexes

6.1. Annex 1 – Legal bases relevant to the application of the Tree Inspection and Diagnostics Standard

Where the inventorying of trees is concerned, it is possible to find direct references to the application of Standards in such detailed regulations as:

- the Regulation of the Ministry of the Spatial Economy and Construction of February 21st 1995 on the type and scope of geodesic and cartographic studies, and on binding geodesic activities in building (the *Dziennik Ustaw* Official Journal of Laws of the Republic of Poland of 1995, No. 25, item 133);
- the Regulation of the Minister of Internal Affairs and Administration of July 24th 2009 on water supply in fire prevention and on fire roads (the *Dziennik Ustaw* Official Journal of Laws of the Republic of Poland of 2009, No. 124, item 1030);
- the Regulation of the Minister of Development of August 18th 2020 on technical standards for the conducting of geodesic measurements of situations and elevations and on the processing and transfer of the results of these measurements to the State Geodesic and Cartographic Resource (the *Dziennik Ustaw* Official Journal of Laws of the Republic of Poland of 2020, item 1429).

Further instruments of law in which it is possible to find a reference (albeit indirect) to the application of Standards to the assessment of trees are:

- the Nature Conservation Act of April 16th 2004 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 55)

[*as is clear, legal provisions here pointing directly to the application of a Standard as regards the inspection of trees are lacking, even as it is also clear that the issuing of certain Decisions must in fact be preceded by a review that does require indications as to both the real state trees are in and circumstances in which trees pose a threat to the safety of people, property or road traffic. The effect is therefore for it to be compulsory that an assessment of the statuses of trees be carried out*].

- the Code of Administrative Proceedings Act of June 14th 1960 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 256, as amended).

[Art.75 §1 here is worded in Polish in such a way that the English translation would be as follows: "…admissible as evidence is everything capable of allowing a matter to be explained […]. Evidence may in particular take the form of […] expert opinions or reviews". Both of the latter are tantamount to an assessment of the state of trees being carried out].

- the Act of July 23rd 2003 on the protection and care of monuments (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 282 as amended).

[*Art. 36, para.1, points 1 and 11 here provide that a permit from the Voivodeship Conservator of Monuments entails engagement in conservatorial work where monuments entered on registers are concerned, with this inter alia entailing the removal in whole or in part of trees or shrubs from a property or part thereof registered as a park, garden or other designed form of green space; as well as the pursuit of other activities; where there is a possibility of the substance of a registered monument being impinged upon or otherwise changed in appearance. Moreover, in accordance with para. 2a (of the said*

Article), the Voivodeship Conservator of Monuments may make the taking of actions under a permit issued dependent on the Applicant's furnishing in a timely fashion of information as regards the activity that has been permitted, by virtue of a relevant reservation or condition. This therefore means that, in order to be in a position to take the relevant Decision, the Conservator of Monuments is to obtain information as regards the statuses of relevant trees]

- the Civil Code Act of April 23rd 1964 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2019, item 1145, as amended).

[*General legal provisions applying in Poland, including as arising out of the Civil Code*[2]*, provide that whomsoever causes another person or persons harm through fault shall be obliged to rectify that harm. This general principle is by itself sufficient to also infer alleged liability where the harm in question is done by a tree. This interpretation relies on the way in which the owner of land on which a tree grows shall be obliged to make necessary efforts (and to not do nothing) in order to guarantee safety on the plot owned. The owner of a plot seeking to be free of the said liability must be in a position to indicate that an accident has not arisen through a lack of any due diligence where maintenance is concerned. In turn, it is possible to construe that neglect has taken place wherever a situation arises in which a tree falls or there is breakage of a part thereof. Beyond that, court decisions and judgments make it clear that neglect arising out of the absence of procedures (including the non-monitoring of the state of trees) does trigger a form of liability for harm the fall of a given tree or branch inflicts. Furthermore, Art. 48 of the Civil Code Act of April 23rd 1964 – i.e. the Dziennik Ustaw Official Journal of Laws of 2017, item 459 as amended) – indicates directly in its wording that the component parts of land include in particular buildings and other installations associated therewith, as well as trees and other plants from the moment these are introduced or sown. In turn, Art. 415 of the Act in question provides that those to blame for doing others harm are obliged to rectify that harm, while it is possible to construe from that general principle that ex delicto*[3] *liability also has application where harm is done by a tree, and that there is liability in tort for harm arising out of a failure to maintain trees in a safe state, by virtue of non-compliance with obligations arising out of principles as regards people's living together amicably in society*[4]*. The owner of land is held accountable for making due effort (and hence not doing nothing) in order to guarantee safety on property. This in fact arises out of Art. 5 k.c., whereby: "No benefit from a right may arise where this is in contravention of the socio-economic designation and destiny of the said right, or with principles as regards shared life in society and the community. Action or inaction of this kind by an entitled person shall not be considered an exercising of rights and shall not incur protection"*]

Furthermore, in its Judgment dated May 9th 1968 – Number I CR 126/98 (as unpublished) – the Supreme Court of the Republic of Poland made it plain that the obligation to take due

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[2] Art. 415 of the Civil Code Act of April 23rd 1964 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2018, item 1025, as amended)

[3] 10 i.e. for the commission of a tort

[4] In his commentary to the Forests Act, Prof. Wojciech Radecki indicated that premises relating to liability on the basis of the blame or fault referred to in Art. 415 of the Civil Code are:
1) harm done to a person or property,
2) culpable conduct (action but also inaction and neglect) leading to harm, where – in line with the view of the notion widely accepted in civil law – there is:
a) unlawfulness as conceived objectively, i.e. a lack of conformity between the conduct of a perpetrator and the legal order thereby entailing the infringement, not only of regulations (as included in different branches of the law), but also of the principles relating to co-existence in society, for example,
b) subjective reprehensibility taking the form of bad intentions or negligence,
3) a cause-and-effect relationship between the said conduct and the harm done.
Source: Radecki W., Art. 11 in the Forests Act. Komentarz, Edition II [online], Wolters Kluwer Polska, https://sip.lex.pl/#/commentary/587670268/537181, as accessed on 7.11.2017.

care of human life and health may arise, not only out of statutory norms, but also out of common sense as backed up by rules in regard to experience that require everyone to avoid risk not dictated by need. Similarly, in Judgments dating from September 6th 1979 (designated I CR 247/79 (OSNC 1980, no. 3, item 57) and from May 28th 1997 (III CKN 82/97 (OSNC 1997, no. 11, item 178), as regards liability in tort for harm incurred by neglect for the maintenance of trees in a safe state, the Supreme Court accepted that liability might indeed be based around people being called to account for their non-compliance with obligations arising out of principles regarding shared life in the community and society[5].

The owner or possessor of a piece of land on which trees grows will, where part of a tree or a whole tree falling inflicts damage, incur *ex delicto* liability arising out of Art. 415 of the Civil Code Act, wherever blame or fault on the said owner or possessor can be established.

6.2. Annex 2 – list of diagnostic features

The table below contains a list of typical diagnostic features with a division into different place of occurrence. While all of the features occurring most commonly are listed, there is no reason for an assessment to be confined solely to the ones presented.

As a tree is assessed, the analysis engaged in needs to relate to at least the following features:

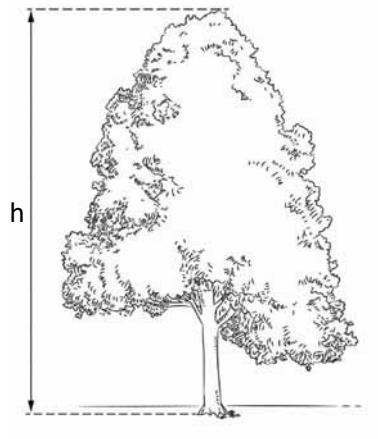
buttress and root folds	on the trunk:	in the crown:	in the surroundings:
• mechanical damage to the extensions of root folds up trunks as well as buttress parts of the trunk (e.g. thanks to padding or abrasion), • splitting of the trunk base, • tree-holes and cracks, • fruiting bodies of fungi, • leaks and seeps, • adventitious and strangling roots, • adventitious shoots, • growth anomalies – bloating of the trunk base (bottle shape), uneven growth in girth (a trunk that is elliptical in cross-section, zones with limited incremental growth), • no visible root collar, • signs of the presence of insects (galleries, exit holes, external dumping of sawdust), • visible damage to roots,	• wounds due to abrasion or padding, • wounds left after limbs were cut or broken off, • tree-holes and cracks, • growth anomalies – trunk distension, signs of uneven growth, as where bark has been lost adjacent to areas progressing normally, • splits (including due to frost action, lightning strikes), • necroses and other damage, including as a result of sunscald, • traces of the presence of insects – galleries and exit holes, sawdust on bark, insect frass and body parts (including parts of integument capable of being identified), • necroses, • protruding or shedding bark, • fruiting bodies of decay fungi, rhizomorphs, • leaks and seeps, • adventitious shoots and roots, • slope of trunk (check if natural), • weak forks (through splitting, cases of inbark, etc.), • mechanical reinforcement	• weak forks (cases of included bark and bark pockets, splits) • forking with breaks • tree-holes and cracks, as well as other signs of rotting along the trunk • splits along the trunk • wounds left from cut- or broken-off boughs (especially in places of topping) • fruiting bodies of decay fungi • thinning of tree-crown, leaf chlorosis and necrosis, leaves too small for the species, premature leaf-fall (potentially indicating root dieback) • dead and dried-out branches • hanging and broken branches and limbs • apex of tree dying back • adventitious shoots along boughs • mistletoe (Viscum album) • signs of the presence of insects on leaves and branches • extended limbs • mechanical reinforcement	• fissuring of the ground possibly indicating destabilisation of part of a tree's root system, • compaction of the ground, • piling-up of earth, • lowering of ground level (subsidence), • excavation around a tree, • technical and building infrastructure close to a tree (and possibly indicating damage to roots), • irrigation systems (encouraging shallow-rooting), • inundation of the ground.

[5] Part of the justification underpinning the judgment of the Supreme Court of 6.10.2011, No. V CSK 414/10, (source: website of the Supreme Court of the Republic of Poland, http://www.sn.pl/orzecznictwo/SitePages/Baza%20orzecze%C5%84.aspx?ItemSID=5525-8dcfa950-a611-4756-8f8a-7df105220758&ListName=Orzeczenia-2&Tresc=zado%u015b%u0107uczynienie&Izba=Izba+Cywilna, as accessed on 7.11.2017.

6.3. Annex 3 – tree measurements

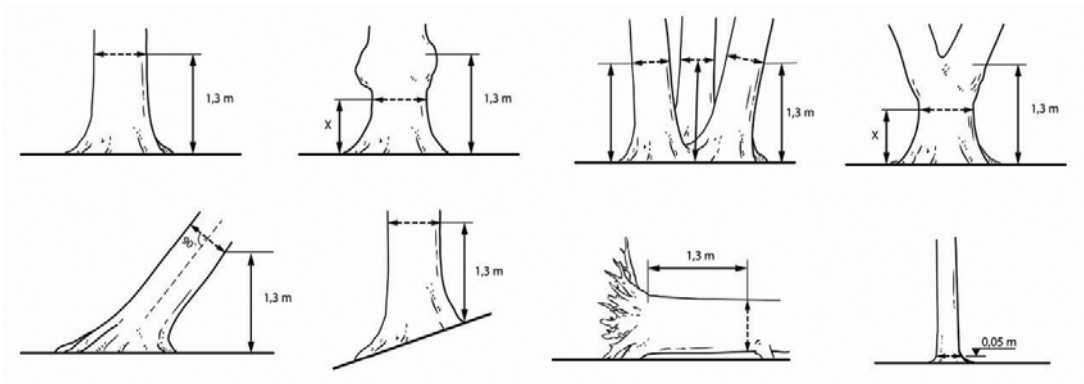
6.3.1. Tree height

The height of a tree is defined as the distance between the base of its trunk and the apex of its crown. Heights are given in metres, though with rounding off to the nearest 0.1 m. The precision of a measurement is dependent on the method applied (including as regards the level of precision associated with the use of a particular instrument).



6.3.2. Trunk girth or circumference

The measure of the broadness of a tree trunk as usually applied and registered is the circumference noted at a height of 130 cm above ground level. However, another measurement involves the diameter, rather than the circumference – again measured at 130 cm and then termed the breast-height diameter. Values for these measures should be given in full centimetres (to the nearest centimetre).



For consistency, trunk measurements should involve the girth or diameter. Where it is nevertheless the diameter that is being noted, two such measurements will need to be made, separated by 90 degrees, with the average of the two readings then taken prior to mathematical recalculation as the girth figure. The ultimate value is supplied in centimetres. Where readings are not to full centimetres, they will need to be rounded off.

Where trees are of irregular shape or habit, the principles to be applied are as follows:

- in cases with irregular girth, measurement should be made at the narrowest point, though as near as possible to a height of 1.3 m;
- in the case of a tree growing on a slope, measurement should be made at the

most elevated point at which contact with the ground is made;

- in the case of a tree that has grown sloping (at a slant), measurement should be made from the side of the inclination, and at right angles to the trunk-axis;
- in the case of a tree that is lying, the measurement should be made at a distance 1.3 m along from the trunk base, as measured parallel to the axis;
- in a case where a tree has multiple trunks (and bifurcations are present below a height of 1.3 m), measurements are made of each of these, with an indication of the nature of the tree's growth given. Then, as details of dimensions are supplied, it is the circumference of the thickest trunk that needs to be indicated.

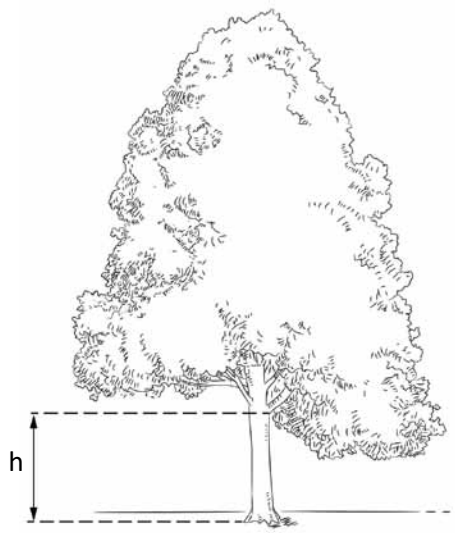
Where a tree's removal is planned (in agreement with the commissioning party), further parameters as follows will need to be invoked:

- (in the case of the measurement of multi-trunk trees), the sum of the girth of the of the thickest trunk as well as half the girths of the remaining trees.
- an additional measurement of girth at a height 5 cm above the ground[6], as and where the girth measured at a height of 130 cm has a value below:
  - 80 cm – in the case of poplars, willows, ash-leaved maple and silver maple,
  - 65 cm – in the case of horse chestnut, robinia and London plane,
  - 50 cm – in the cases of other tree species.

NOTE: the rules indicated above arise out of detailed legal provisions[7] and may therefore be subject to amendment – hence a need for verification each time.

6.3.3. Crown base

This parameter is defined by reference to the distance separating the base of the trunk from the point of attachment there of the lowest crown branch. Single branches, in particular those in the form of offshoots growing beyond the limits of the crown's main part are not taken account of as this measurement is being made. A permissible measurement error in this case reflects the equipment used. The units here are metres, though as rounded off to the nearest 0.1 m.

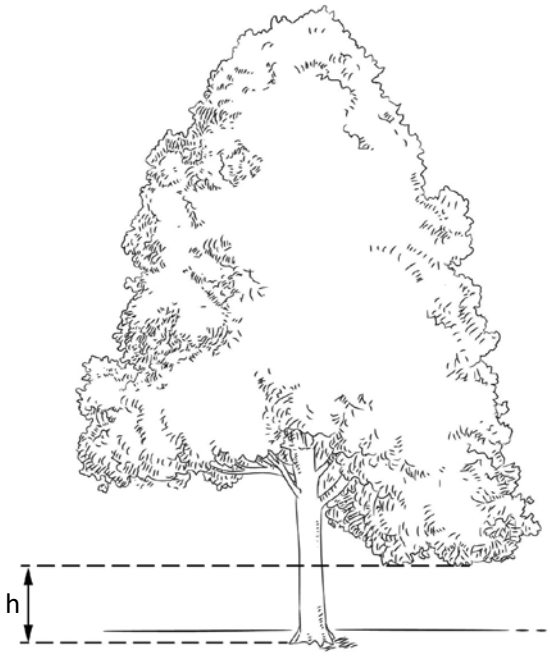


[6] 13 The justification for this measurement to be made arise out of Art. 83f, para. 1, point 3 of the Act of April 16th 2004 on Nature Conservation (i.e. the Dziennik Ustaw Official jornal of Laws of the Republic of Poland of 2018, item 1614, as amended)

[7] 14 the Nature Conservation Act

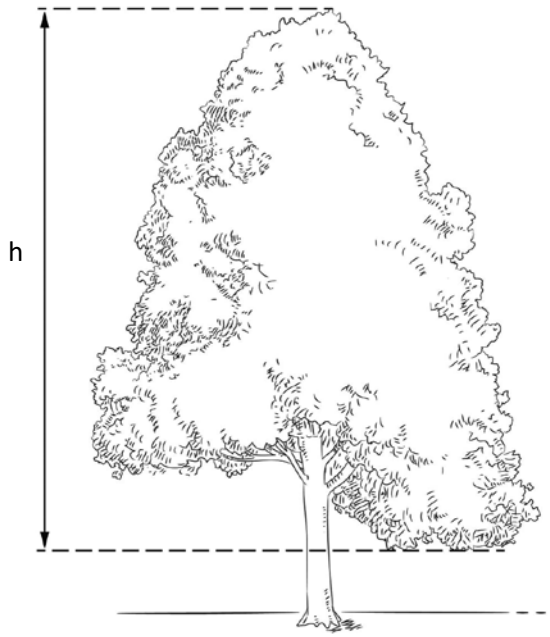
6.3.4. Clearance height

This parameter is defined as the distance separating ground level from the lowest part of the lowest branch forming part of the true crown. The measurement is provided in metres, as rounded off to the nearest 0.1 m.



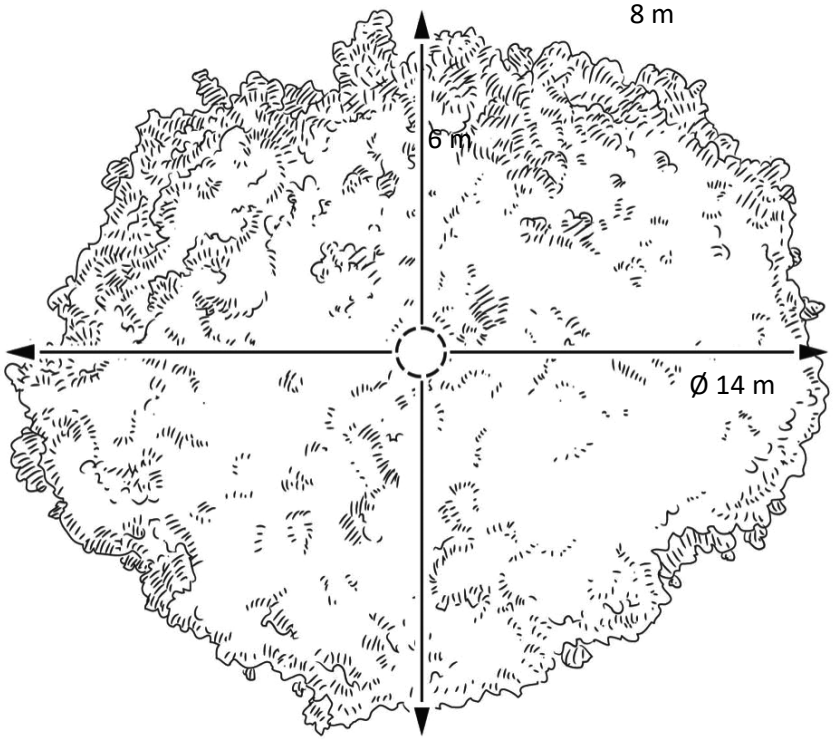
6.3.5. Crown height

This parameter involves the difference between the height of the tree overall and crown base height. The measurement is in metres, with rounding off to the nearest 0.1 m.



6.3.6. Crown diameter

This is determined as the mean of 2 measurements made across the crown at right angles to each other (or potentially also as the sum of two radii (measurements from the trunk to the limits of spread of the crown) that are again at right angles to each other. Where a crown is markedly asymmetrical, one measurement is made along the longest axis and the second in a direction at right angles to the first. Both values will then need to be supplied in order to characterise the tree. The units here are metres, rounded off to the nearest 0.1 m. In justified cases (involving an advanced assessment or the need to detail the potential or actual zone of influence of a crown), it is possible to measure radii for the longest and shortest axes, and to offer the compass directions involved (in degrees).



6.4. Annex 4 – phases to a tree's developmente

Phase of development	Description	
Young tree (youth phase)	Charaterised by strong apical dominance and prevalent height growth. Crown structure may be transitional between the temporary and mature crown (in the case of the need to maintain property margins), and can be made subject to crown-shaping measures. It is usual for this phase to continue for up to 20 or so years after planting.	
Alternatively	Young tree (youth)	A tree that has been planted or is self-sown in which the prevalent feature is upward growth. Where trees have been shaped on account of the presence of property margins, this will be the time of achievement of the target height for the lowest point of attachment of crown branches.
	Maturing tree (maturation)	An acclimatised tree (i.e. one that has "taken") which enjoys this status has expansion of the crown even as clear apical dominance remains. Where trees have been shaped on account of the presence of property margins, this will be the time at which there is achievement of the target height for the lowest point of attachment of crown branches.
Mature tree (maturity)	A tree of stabilised height and crown volume in which apical dominance is now weakened. The structure of the crown is also now of a more permanent nature (it is not temporary or interim). The tree has attained or is close to attaining its maximal crown dimensions (given the species, location and site type).	
Ancient tree	A tree that has reached an age exceptional for a representative of its species, often manifesting this in greater trunk thickness than would be typical. Where species are longlived, this phase may prove the longest in a tree's life. It is quite possible that the crown will manifest peripheral dieback, with a secondary crown taking shape at a lower level (in a phenomenon otherwise known as crown retreat). Such trees are often of high natural and cultural value. This phase sees the interior of the trunk featuring many flaws, scars, wounds and hollowed-out areas, all of which can provide microhabitats for other species.	
***damaged**	A tree whose functioning had been changed markedly by natural events and/or improper measures taken (e.g. crown decapitation; damage to crown, trunk or roots; a dramatic change in habitat conditions). It is typical for such a state and status to be reported in a tree's youthful or mature phases.	

6.5. Annex 5 – the vitality assessment

This is independent of the stability assessment, even as it is a component part of the assessment regarding a tree's condition. The vitality assessment makes use of a modified Roloff scale[8]. There has been a chance of numbering and naming of the levels of vitality for the sake of consistency with the system of assessing trees adopted by this Standard (and hence on a scale from 1 to 5, given that a "O" designation may not be used in electronic databases).

Given the way in which different parts of a tree may show differentiated levels of vitality, the feature is in principle assessed in regard to the whole upper third of the tree crown. Furthermore, vitality needs to be viewed from the point of view of the tree's development. A young and healthy tree typically shows a 1 (i.e. 0 on the Roloff Scale), while a maturing one rates a 2 (1), and a mature specimen a 3 (2). Over-mature trees and those now gradually dying off do not match any particular depiction in line with the Roloff Scale, with a detailed diagnosis in relation to the crown potentially therefore requiring separate vitality assessment.

Offshoots are usually depicted for a 2 on the scale (i.e. a 1 after Roloff), in fact irrespective of the overall vitality of the tree as such. This in turn dictates that they should be excluded from any overall assessment. Vitality is described in line with the scale below (after the aforesaid Roloff):

Numerical designa-tion	Number after Roloff assigned for degree of vitality	Description
1	0	The tree is in a phase of strong incremental increases in the length of stems, with this being true both apically and in relation to the side branches (the two categories both growing dynamically and evenly, with mostly long stems produced). A dense and even foliage has been generated by the time summer arrives.
2	1	The tree has slightly reduced stem increment, side branches are more truncated than in the apex, and with free space appearing between those present in the crown, visible even when tree in full leaf.
3	2	The tree has distinctly curtailed incremental growth of all its stems (only short stems are present), and is characterised by little or no further growth in height, while distinct gaps in the crown are to be noted when the tree is in full leaf.
4	3	The tree shows varying degrees of dieback in different parts of the crown.
5	Nd.	The tree is dead

[8] 15 Roloff A., Vitalitätsbeurteilung von Bäumen. Aktueller Stand und Weiterentwicklung, Braunschweig, 2018; Roloff A., Handbuch Baumdiagnostik. Baum-Korpersprache and Baum-Beurteilung, Stuttgart, 2015.

6.6. Annex 6 – the condition assessment

Condition is assessed in line with the scale given below. The criteria supplied need to be treated in an indicative sense, and the assessment should ultimately be a comprehensive one. Equally, compliance with all criteria is not required for a tree to be assigned to one category or another.

1 condition very good	• lack of damage within the crown and trunk worth noting • no great amount (only up to a 10% incidence) of deadwood arising through natural processes and having no influence on tree physiology • no damage to the assimilatory apparatus • no signs of disease or the presence of pathogens is to be noted • permissible wounds are present following measures taken in the proper way (there is a very good reaction to wounding, with scar tissue overgrowing slowly and with wounds therefore closed or closing) • concordance between vitality classes after Roloff and the phase of development of the tree (see 6.5)
2 condition good	• signs of (up to 30%) damage to the roots still of limited significance to the tree's overall condition • limited damage affecting (up to 30% of the circumference of) the trunk and boughs, with the influence on physiology limited in consequence • deadwood of up to 30%, influencing the physiology of the tree to only a limited extent • up to 30% damage to the assimilatory apparatus, sufficient to exert only a limited influence on tree physiology • diseases present do not exert a greater influence on the condition of the tree • there is a weak but noticeable reaction to wounding, with overgrowing scar tissue • the fruiting bodies of fungi that are present are of limited significance to the tree's condition
3 condition impaired	• signs of (up to 50%) damage to the roots, sufficient to have a clear influence on the condition of the tree • damage affecting (up to 50% of the circumference of) the trunk and boughs, with a consequent distinct influence on the physiology of the tree • the trunk and main branches of the tree feature single fruiting bodies of species of fungi • deadwood of up to 50%, having a distinct impact on the tree's condition • up to 50% damage to the assimilatory apparatus, sufficient to exert a marked influence on the condition of the tree • in the crown part, up to 50% of its volume has signs permissible as indicating root damage, e.g. with raised ground level etc. • there is an impaired reaction to wounds (on trunk and main branches) that are of significance to the physiology of a weakened tree; wound tissue not overgrowing nicely and wounds not therefore healing • diseases present are capable of exerting an influence on the whole tree (denoting an impairment or weakening of condition) • if there are more than two key features indicative of an "impaired" condition, the tree should be classed as "much impaired", and hence given a 4
4 condition much impaired	• signs of (more than 50%) damage to roots, having a major influence on the condition of the tree • damage to the trunk base, trunk and main branches (extending around more than 50% of the circumference of the tree or branch) is exerting a significant influence on tree physiology • extensive wounding along the trunk and boughs (around more than 50% of the circumference), hence with a major influence on tree physiology that hinders the conducting of assimilates; very limited or zero reaction to wounding (scar tissue does not grow over) • the presence on the trunk and main branches of numerous fruiting bodies of species of fungi is sufficient to influence physiology of the tree significantly • deadwood account for more than 50% of crown volume • more than 50% of crown volume is characterised by damage to the assimilatory apparatus • diseases present are leading to serious impairment off the tree's condition
5 condition critical (tree in need of urgent intervention)	• most of the tree is dead or dying (afflicted by irreversible damage)

6.7. Annex 7 – the stability assessment

The criteria mentioned here need to be regarded as indicative, with the final assessment anyway required to be comprehensive. The assignment of a tree to one or other category does not require that all criteria taken together are met. Stability is determined in line with the following scale:

1 - condition very good	• absence of features impairing the stability of the tree or parts thereof • no tangible signs of a threat of the whole tree or part thereof falling (or of the tree being toppled or uprooted) • the tree is too small or young to pose a threat even were the risk of the whole tree or part thereof falling to arise (or else the risk of its being toppled or uprooted) • limited presence of deadwood up to 3 cm in diameter • limited (up to 5%) presence of deadwood up to 5 cm in diameter • diagnostic features are at such a low level of occurrence that the tree requires no measures whatever
2 - condition good	• absence of features impairing the tree's overall stability • some limited decay now affecting wood in the trunk and main boughs, with single tree-holes or cavities present • impaired branching within the crown • presence of features impairing the stability of branches more than 10 cm in diameter • limited deadwood (up to 10% and with a diameter of up to 10 cm) • presence of single broken branches (of diameters up to 10 cm) suspended in the crown • level of occurrence of a feature can usually be kept in check by way of basic measures (e.g. dead-branch removal, pruning to thin the crown), indicating that specialist work does not need to be resorted to
3 - condition impaired	• decay or loss of (up to 50% of) main skeletal roots around the circumference of the tree • unnatural inclination of a tree showing signs of compensatory growth • trunk decay present over up to 50% of the cross-sectional area • cavities extending to up to 50% of the circumference of the trunk • presence (on root folds, at the trunk base or along the trunk) of individual fruiting bodies of species of fungi whose growth is capable of impairing a tree's stability • impaired forking of the main boughs • a significant (up to 50%) share of deadwood of diameter up to 10 cm • presence of several features still at an early stage of development • the range and extent of features is such that specialist measures (such as technical cięcia, tying, etc.) will usually need to be pursued to limit risk
4 - condition much impaired	• considerable (more than 50%) decay of skeletal results, trunk and boughs • recent tipping of tree showing signs of a loss of stability in the ground • fruiting bodies of fungi have appeared on the root buttresses, around the trunk, and on the trunk and boughs • there are many holes and cavities along the trunk and main branches (over more than 50% of the girth) • there are splits and fissures across the trunk and main branches • forking of the main trunk and boughs is weakened (with inbark and splits) where the diameter of trunk or boughs exceeds 25 cm • deadwood at a level of more than 50% or involving girths greater than 10 cm • suspended and broken large crown-branches of diameters over 10 cm are present • features are of such a scope that they may usually require specialist measures (as the features are capable of weakening the whole tree considerably and are likely to abbreviate its prospects of going on living, the action to be taken is an alternative to removing the tree)
5 - condition critical (tree in need of urgent intervention)	• the state of a tree poses a direct threat to property, or human life and health • stabilisation of the tree can only be achieved if there is major damage or destruction in the process, in the face of a lack of other possibilities to safeguard the tree's surroundings • the extent of the feature or defect is such as to require that the tree be removed – the alternative would at best be to leave a so-called witness tree • immediate intervention is often necessitated

6.8. Annex 8 – the life-prospects assessment

This expresses a tree's potential to go on functioning properly. The assessment is based on a tree's condition (including vitality as set against the phase of development), as well as its stability, in line with a scale as follows:

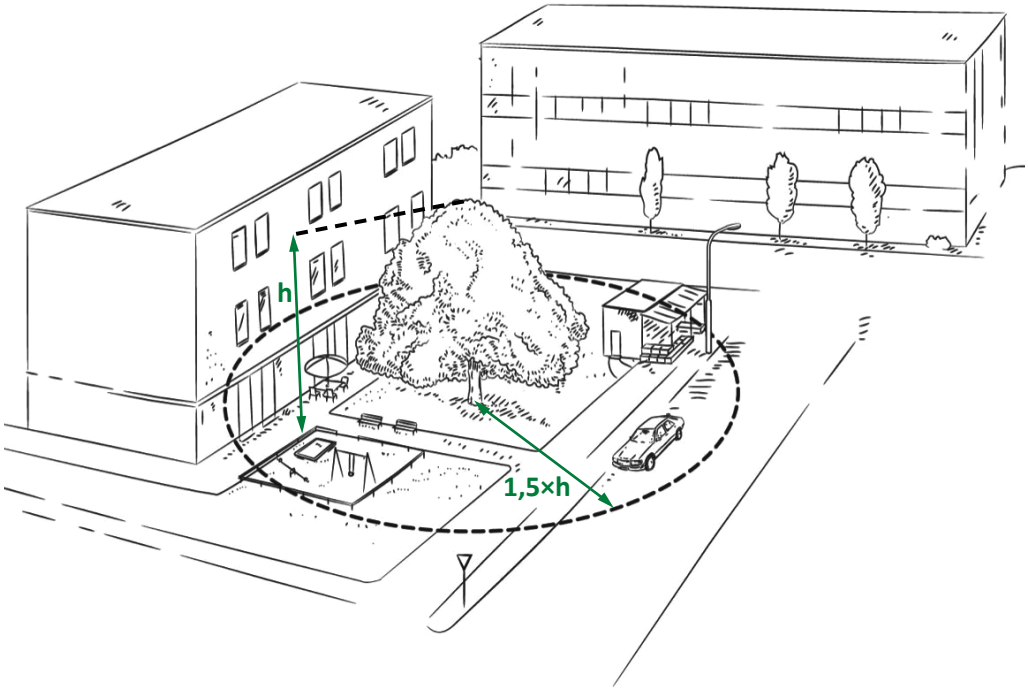
A – long-term prospects	Tree with at least 10 years' forecast lifespan in the circumstances of proper overall maintenance of life processes
B – short-term prospects	Tree anticipated to go on living, with proper maintenance of life processes, for 3-10 more years
C – no prospects	Tree that has lost its vitality or will do so within 3 years

6.9. Annex 9 – the values and significance assessment

Category of tree	Assessment criteria			Marking on map
Tree to be preserved:				
	Dendrological value	**Cultural (including landscape) value**	**Natural value**	
Category A – Drzewa wysokiej wartości, z szacowaną pozostałą długością życia powyżej 10 lat	Drzewa, które są wyjątkowymi reprezentantami danego gatunku, szczególnie wtedy, gdy są rzadkie. Także te, które stanowią znaczący element zadrzewień.	Drzewa i zadrzewienia o szczególnej wizualnej wartości odgrywające znaczną rolę w krajobrazie.	Drzewa i zadrzewienia będące siedliskim lub potencjalnym siedliskiem gatunków cennych i/lub chronionych.	
Category B – drzewa umiarkowanej wartości z szacowaną pozostałą długością życia co najmniej 3–10 lat	Drzewa i zadrzewienia o niższej wartości niż w kategorii A. Także te, które mogłyby się znaleźć w kategorii A, ale ich stan na to nie pozwala ze względu na występowanie cech diagnostycznych wskazujących na skrócenie życia drzewa.	Drzewa rosnące w grupach, co daje im większą wartość, niż gdyby rosły pojedynczo oraz drzewa rosnące w grupach, ale zlokalizowane tak, że nie mają większego wpływu na lokalny krajobraz.	Drzewa wykazujące cechy, które w przyszłości mogą stanowić potencjalne siedlisko gatunków cennych i chronionych.	
Category C – drzewa najniższej wartości z szacowaną pozostałą długością życia do 3 lat lub młode drzewa o średnicy poniżej 15 cm	Drzewa o małej wartości i w słabym stanie uniemożliwiającym zakwalifikowanie do powyższych grup.	Drzewa rosnące w zadrzewieniach, ale nie mające większego wpływu na grupę, w której rosną. Drzewa i zadrzewienia mające niską i krótkoterminową wartość w krajobrazie.	Drzewa niewykazujące znaczącej wartości przyrodniczej.	
Trees that may not be preserved, or whose preservation demands very specific action				
Category U – trees whose state does not allow for their preservation (in their present state / dimensions or location)	1. Trees with diagnostic features that are serious in nature, and point to a high probability of the whole tree falling in the nearest future.			
	2. Trees that are dead or show signs of abrupt and irreversible dieoff or dieback.			
	3. Trees with clear symptoms of serious and irreversible disease and the presence of pathogens doing a great deal to weaken and impair the condition and/or stability of the entire tree; as well as trees of low value tending to stifle higher-value neighbouring trees.			
	NOTE: Trees in this category may exemplify features valuable from the natural, landscape or other points of view that leave them worthy of preservation, on condition that criteria as regards safety in the surroundings are met.			

6.10. Annex 10 – the level or degree of use made of the surroundings

The zone within which a tree has the potential to give rise to risk (of harm or damage being done) is denoted by an area of radius 1.5 times the height of that tree, where the source of concern is the possible uprooting of the entire tree. Where the elevated risk is thought to be posed by just part of a tree (e.g. a bough thereof), then the size of the zone on the ground associated with that risk is given by doubling the length of the part in question.



Equally, where land slopes (potentially allowing a tree or part of it to shift or slide), the above distance should be increased somewhat to take such possibilities into account. Obviously the extension should be in the direction in which the slope runs (though this will not apply where escarpments are shorter in length than the heights of the trees growing on them).

Intensity of utilisation

The assessment analyses the frequency of occurrence of people at the place where a tree or part thereof may potentially fall. Intensity of use is dependent on the level of traffic and is anyway assessed separately in line with the specific features of a given site or area. Given below are examples of assessment criteria relevant to this particular kind of work – though potentially also helpful when it comes to the criterion-based delimitation of a monitoring zone. All places in which grown trees of diameters measured at a height of 1.3 metres are below 15 cm are regarded as not posing a risk. However, these will need to be inventoried anyway, given the potential necessity for them to be subject to measures like pruning to help shape the crown better.

Intensity of utilisation, where use is:	Characteristics
non-existent	No presence (or at most **sporadic** presence) of people within an area delineated by a radius 1.5 times the height of the tree
rare	Perhaps present along roads with limited traffic, in parks and gardens off the beaten track, in urban forests, and so on
frequent	Indicated by the presence of roads with a moderate level of traffic, and/or tracks, paths or trails for those on foot or cycling through parks and gardens, sports facilities or the environs of popular places and buildings capable of attracting large numbers of people.
constant	Relates to places used most intensively by people. The category therefore includes city centres, heavily-frequented roads, and places visited by people from outside very frequently and regularly. Continuity or constancy of utilisation does not in fact entail one person or another being under a tree all the time. Rather the presence should be confirmed on most (a majority of) days.

6.11. Annex 11 – assessment in relation to specific diagnostic features

The feature under assessment (like damage, decay, form or structure of the tree) has assigned to it an index that describes the degree to which it is significant, in line with the four-level scale detailed below. It is assumed that the total absence of any given feature corresponds with a notional fifth (zero) level that is not in fact given on the inspection form.

Ocena cechy	Characteristics
1 – slight	feature has only a limited influence on the risk that the whole tree or part thereof will fall, either in the context of normal weather or extreme weather conditions
2 – moderate	feature does operate to ensure a greater risk that the whole tree or part thereof will fall where extreme weather conditions arise, though no such response is anticipated in normal weather
3 – serious	feature enhances the risk that the whole tree or part thereof will fall even under normal weather conditions
4 – critical	the process leading to the fall of the tree or part thereof is already underway or foreseen in the nearest future, even if the weather remains safe- immediate action is therefore required.

Where features related to the site type are concerned (e.g. state of the soil or limitations on development), the 1–4 scale expresses an estimated influence of the given feature on the wellbeing of the tree, with 1 denoting only a limited influence, while 4 relates to a major one.

A glossary of concepts and ideas

areas of public utility – land whose function is to meet the needs of the public and whose characteristic feature is broad accessibility

assessment of the state of a tree (of a tree's state) – a by-eye or instrument-based investigation determining of the state a tree is in, or else the stability of a tree or part thereof

cyclicity of work – relating to the period of time after which a given job or tasks is subject to repetition

a diagnostic feature – a (visual) feature capable of being identified by eye, or else with the aid of simple tools applied in tree diagnostics such as a mallet or probe – with this relating also to non-visual features capable of being reported using other senses like hearing [a feature once diagnosed serves in the identification of problem trees (and threats), and can also represent a basis upon which to point to the need for a specialist assessment to be carried out]

belts along public roads – in the Polish context, as defined in the Act on public roads[1]

forest land – when defined as such (under the abbreviation Ls) in land-registration documents

forms of nature protection (forms by which nature is protected) – in the Polish context, in accordance with the provisions of the country's Nature Conservation Act1[2]

forms of protection of monuments (forms by which monuments are protected) – in the Polish context, in accordance with the provisions of the country's Act on the protection and care of monuments[3]

green areas or greenspace – in the Polish context, areas as referred to in the country's Nature Conservation Act[4]

hyperspectral data – imaging data obtained from flight height, registering a narrow range of electromagnetic radiation from visible light through to the mid-infrared

inventory(ing) of trees – a process by which core data are gathered

a land registry map – a general (1:500, 1:1000, 1:2000 or 1:5000-scale) map containing information on the route taken by fencing or other boundary markers and site infrastructure of various kinds, and showing the siting of a building or the course and names of streets and other thoroughfares.

laser scanning – a method of obtaining spatial data, for example from the air, in the form of a cloud or points reflecting the elevation of the land, the form of land cover and

[1] Art. 4, point 1 of the Act of March 21st 1985 on public roads (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 470).

[2] Art. 6, para. 1 of the Act of April 16th 2004 on nature conservation (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 55).

[3] Art. 6, para. 1 of the Act of July 23rd 2003 on the protection and care of monuments (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 282).

[4] Art. 5, point 21 of the Act of April 16th 2004 on nature conservation (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 55).

the vertical structure of vegetation

marking of trees – an adopted system by which trees are marked in the field, usually by way of labelling with an identification number attached in one way or another to the trunk of a tree

a master map – represents basic cartographic material[5], in the sense of its being a detailed map (elaborated at the scales 1:500 or 1:1000) of a spatial situation with surveying points; limits of plots relevant to land registration; buildings; an indication of land use and classification; infrastructure, buildings, installations and other topographic objects, including trees and shrubs

measures – a set of jobs or tasks to be carried out on a tree that are necessary or essential if the stability of the whole specimen or part thereof is to be improved, or else with a view to improving habitat conditions

a method – a way of proceeding that leads to the resolving of a given problem and achievement of a defined aim.

methodology – a choice of methods entailing a standardised approach to a given problem

an orthophotomap – a map presenting the land surface which arises through the cartometric processing of aerial photographs or satellite imagery, and is done in real colours or in the near infra-red

a phase of development (development phase) of a tree – a matter of the physiological age or stage of ontogenetic development that a tree has reached

problem trees – those with features indicative of impaired overall or partial stability to an extent that makes possible the breaking of a tree or part thereof, or else the throwing or fall of the tree as a whole

public procurement – in the Polish context, in accordance with the provisions of the country's Public Procurement Law Act[6]

recommendations – a descriptive listing of measures needing to be pursued in regard to a given tree or its surroundings (including the gathering, storing and management of data on the tree).

remote sensing – the gathering and processing of data obtained through the registering of reflected or emitted EM radiation, using specialised sensors such as laser scanners and hyperspectral cameras

risk assessment in the surroundings/vicinity of a tree – a set of actions encompassing the assessment of trees and reported threats to the stability of whole specimens or parts thereof, as linked with land use and the possibility of harm to property or people arising

SIWZ (Specyfikacja Istotnych Warunków Zamówienia, i.e. – in the Polish context – the specification of key conditions that are to underpin a given procurement order)

a specialist assessment – a process of the advanced study and testing of trees, going by the name of tree diagnostics in other works

the surroundings or vicinity of a tree – the area around a tree in which some change or transformation is capable of influencing the state or stability of a tree or part thereof

5 Art. 2, point 7 of the Geodesic and Cartographic Law Act of May 17th 1989 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2020, item 276 with subsequent amendments).

6 the Public Procurement Law Act of September 11th 2019 (the Dziennik Ustaw Official Journal of Laws of the Republic of Poland of 2019, item 2019).

a tree inspection – the basic kind of assessment of tree, whereby data relating to diagnostic features (including obvious ones) is gathered

a tree-inspection or tree-decay probe – a simple diagnostic instrument used in a basic assessment, whose main element is a metal rod several tens of centimetres long

tree management (management of trees) – a set of activities associated with the maintenance of a tree in a given area, with this taken to include the collection, storage, processing and management of data regarding trees.

tree stability – a measure of the resistance of a tree, or part thereof, to breakage or uprooting.

urgency of work – as defined in relation to the time within which given tasks ought to be carried out.

utilisation or use (level or degree of utilisation or use) of an area – characterises the intensity of movement (traffic) among people or vehicles in an area possibly or potentially influenced by a tree or part thereof.

work technology – choice or selection of a given type of work to be carried out (intervention made) in regard to a given tree.