

Forest therapy in Italy: proposal of a standard procedure for validation of suitable sites

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The social and health benefits that green areas and forests can provide are now recognized in the scientific community worldwide. There is a growing interest in and demand for forest care initiatives and nature-based therapy, also as a result of the impacts of Covid-19 pandemic. In Italy, the increasing interest in alternative and integrated solutions for care and healthcare promotion have laid the basis for the implementation of several projects and activities, particularly those known as Forest Therapy (FT). These initiatives provide a business opportunity for forestry and social sectors, for the development of rural areas, and they are a cost-saving opportunity for the National Health System because of the expected benefits (as assessed by several clinical studies confirming the therapeutic effectiveness of these activities). Despite the importance, in Italy there is not a specific legal basis and standardized procedures to determine the suitability of a FT site. As a result, FT initiatives have been carried out in different environments, whether in urban or extra-urban forest areas, with the implementation of activities deemed suitable in a “self-referential” approach. Establishing a standard procedure for the recognition of FT suitable locations and related FT activities is a first step for the promotion of an important instrument that can meet several social needs. This work proposes (i) a standard procedure (“*iter*”) for the validation of a Forest Therapy and Urban forest therapy (UFT) site by the competent authority to obtain the official “environmental recognition” of site suitability; (ii) the technical and objective criteria to assess the stationary and environmental parameters of a site in order to be qualified as a FT/UFT site, both in natural and urban contexts. The *iter* and criteria proposed take into account the relevant national regulations, the literature found on the subject, and the expertise of scientists and technicians. The procedure and criteria proposed can be used as basis of a regulation on FT in Italy, ensuring suitable sites officially recognised by public institutions and providing a high-quality service to society. Finally, a baseline regulation would also facilitate opportunities for dedicated funding, as well as the recognition of “green prescriptions” for the prevention and treatment of certain health problems.

Keywords: Forest, Forest Therapy, Urban Forest Therapy, Site Suitability, Validation Process

Introduction

Spending time in nature to get benefits for physical and mental health has been practiced by society for centuries in different cultures. In 1982 the Japanese Ministry of Agriculture, Forestry, and Fisheries gave for the first time the definition of “Shinrin

Yoku” (“Forest Bathing”). Since then, the concept became the subject of several studies demonstrating how and why “immersion” in natural environments provide benefits to psychophysical health and can contribute to tackling certain non-communicable pathologies (Park et al. 2010, Sem-

pik et al. 2010, Boere et al. 2023). From Green Care to Forest Care Initiatives, there are many general terms indicating practices that improve physical, psychological, and social conditions with playful and/or recreational interaction with nature, even though nature-based therapy (Doimo et al. 2021). In particular, the benefits of immersion in forest environments are associated with reduced levels of stress, anxiety, and depression (Mao et al. 2017, Farrow & Washburn 2019, Meneguzzo et al. 2021, Donelli et al. 2023b), increase in creativity (Yu & Hsieh 2020), with positive effects also on the respiratory, cardiovascular and immune systems (Li et al. 2010, Ideno et al. 2017, Kotte et al. 2019, Donelli et al. 2023a). The role of forests for the contemporary society and their ecosystem services influencing human health (Sandifer et al. 2015) are crucial. According to an estimate of the European Strategy and Policy Analysis System (ESPAS 2019), by 2030 at least two-

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thirds of the world's population will live in urban areas (83% in Italy). The progressive moving away from nature has effects on people's psycho-physical well-being, lifestyle-related disease and mental illnesses, and consequently on the relative health costs (Lee et al. 2017, Leavell et al. 2019, Takayama et al. 2019, Turunen et al. 2023). Spending time in forests has become increasingly valued by people living in urban settings, with high levels of stress and sedentary lifestyle (Antonelli et al. 2023, Sung et al. 2012). Besides, there are evidence that forest immersion facilitates preventive and therapeutic measures for mental and physical health (Song et al. 2016, Wolf et al. 2020, Sen 2020). In recent years an increase in the activities "labelled" as Forest bathing (FB) and Forest therapy (FT) in forest areas (often confused with each other) has been observed. This new trend responds to the growing demand for access to natural environments associate with the growing awareness of their importance, exacerbated by the climate crisis and the pandemic period, as mentioned in the State of the World's Forests report (FAO/ UNEP 2020, Doimo et al. 2020, Naomi 2020). At present, FB and FT are developed in different countries, according to different locations, practices, and specific peculiarities (Zhang et al. 2022). In Korea FT is recognized as a good practice for individuals and it has been promoted also for its positive effects on the development of local circular economy (Shin et al. 2010). In Japan FB and FT, promoted by the Forest Therapy Society and other institutions, are recognized as medical practices, and are supported by the Ministry of Agriculture, Forestry and Fisheries (Imai 2012). Also, Japan has a certification system for FT sites (since 2005, 65 forests have been approved) and forest therapists, that also has a positive effect on the development of circular economy (Li 2023, Zhang & Ye 2022). In Italy, FB and FT can be considered an evolution of initiatives that have already been conducted for over a century in search of psychophysical wellbeing, such as those promoted by the Italian Alpine Club (CAI) and various environmental associations. The topic of FT and FB has been addressed by an increasing number of research projects and studies conducted at national level, e.g., the Green for Care project (<https://www.greenforcare.eu/>) or the collaboration between CAI and the National Research Council of Italy (Luchesa & Gatto 2021, Meneguzzo & Zabini 2020). All these initiatives have been developed in very different sites without public recognizing of the suitability and qualified therapists with personalised therapy program. Indeed, although the Italian National Forestry Strategy (MIPAAF 2022) recognizes the importance of FT initiatives among the socio-cultural services of forests, actually there is not a specific regulatory framework, neither common public standards for FT sites evaluation (e.g., forest composi-

tion, accessibility, etc.) and for the training of the medical and technical staff involved in FT. In particular, the characteristics of forests where FT is carried out are often not sufficiently analysed to establish if the site is suitable for the FT/UFT activities in terms of safety and effectiveness, considered as key requirements by recent studies (Gobster et al. 2023, Immich & Robl 2023). There are only some private associations and certification bodies which have proposed standards to certify suitable areas for "forestry wellbeing" or sites called "forests of wellbeing", with the purpose of FB activities or generic "improving wellbeing and health of people" (Grilli & Sacchelli 2020, Borriello et al. 2022). The present and future challenges of the growth of the national forestry sector impose a regulation and a framework identifying suitable FT sites and releasing the suitability qualification to protect users as well as the natural environments (Rosa & Collado 2019). Such recognition could potentially enhance the competitiveness and multifunctionality of enterprises (Lawrence et al. 2010) and territories, mainly mountainous and marginal or rural areas. Then, FT represents an important entrepreneurial and employment opportunity for the Italian forestry sector and for many rural areas (Cubbage et al. 2007, Di Iacovo & Connor 2009, Secco et al. 2018). It could also lead to a health system of "green prescriptions" (Buckley 2019, Meneguzzo et al. 2021) for preventive and therapeutic purposes with benefits for the National Health System. Recognizing a site suitable to be used for FT and assess its specific characteristics is the focus of this paper. Although some studies have found no significant differences in the results of activities carried out between natural and urban environments (Menardo et al. 2021), the work distinguishes between FT in natural sites and Urban Forest Therapy (UFT). They are both important but very different because of their locations, which entail different environmental features and management methods (Marušáková et al. 2019). Urban forestry sites are exploited especially by people living in the city, who can access them more quickly and frequently (Vujcic et al. 2017). "Natural sites", far from urban areas, are less exposed to noise and visual disturbance, and to air pollution, but they require longer time to be reached. This study proposes: (i) a standard procedure ("iter") for the validation of a FT/UFT site by the competent authority to obtain the official "environmental recognition" of site suitability; (ii) the technical and objective criteria to assess the stationary and environmental parameters that a potential area must possess to be qualified and recognized as a FT/UFT site.

Materials and methods

Iter

The procedure to validate the FT site suitability is mainly based on methodologies

adopted in Italy for the institutional recognition of Monumental Trees (MASAF 2013) and of Old Growth Forests (Interministerial Decree 2021). In particular, the procedure for the identification of monumental trees starts with an identification form where all the characteristics of the candidate tree must be reported. The form is filled by an agricultural or forestry technician of the Municipality, which proposes the candidature to the Region. The competent regional office checks and validates the information reported and, if these meet the monumental criteria, the tree is included in the National List of Monumental Trees. The inclusion requires some management activities to guarantee the maintenance of the good health and conditions of the Monumental Tree. A similar procedure is used for the identification and the official recognition of Old Growth Forests. The candidature is presented to the competent regional office through an identification form, where the scientific information relating to the characteristics of the site are reported. The regional office checks and validates the information reported and if these meet the scientific criteria needed for the forest to be considered an Old Growth Forest, the site is added to the National Network of Old Growth Forests.

The Technical Information Sheets (TIS)

To realize the procedure described above, four Technical Information Sheets (TIS) are proposed with 90 parameters representing the minimum criteria to be assessed to consider the site suitable or not for FT. The sheets are related to; (1) Identification registry; (2) Management; (3) Accessibility and use; and (4) Protection and regulation. The TIS include key information about the site need to be reported by the applicant. The list of criteria comes from the scientific literature available on the web on the broad topic of forest care, using combinations of key words, e.g., forest therapy, wellness, activities, etc. Several works were retrieved from grey literature, including conference proceedings, scientific papers in print, and from information gathered through the research group's contacts with Universities and research institutes. This explorative research shows a mosaic of information and data revealing the heterogeneity of forest care sites and initiatives in Italy. The literature collected was subsequently filtered selecting FT initiatives and discarding generic leisure, recreational and sports forest bathing activities, which do not involve the support of therapists. The selected criteria reflect the essential features of the forest environment for the development of forest therapy activity and services, such as location, landscape features, characteristics of forests, forest management, accessibility, anthropogenic conditions, etc. An important guideline in this selection has been a study carried out in Bulgaria (Dodev et al. 2020) that considers 22 indicators to characterise the forest, envi-

ronmental and anthropic features of the sites where FT projects can be implemented. Fourteen of these indicators have been proposed in this study, some of which were modified or broken down into a larger number of indicators, based on the characteristics of Italian forests. For example, the indicator “Composition of forest stand (tree species, number and type – coniferous and deciduous)” has been split into a larger number of items to capture more aspects (Vegetation species, Percentage of forest cover, Distribution of the tree component, Large live trees, Deadwood and decaying wood, etc). Moreover, several other parameters have been added to characterise areas where FT initiatives could be implemented (information on site location, management activities, silvicultural systems, facilities, equipment, environmental constraints, risks, etc.). Regarding the FT sites in Italy, several studies have been considered. Based on Doimo et al. (2021), 12 sites from the 232 forest-based care site initiatives have been identified including 9 declared as FT site and 3 declared Social Inclusion (Physiological and Psychological, in Motivation-Effects) sites. Further 6 cases including FT initiatives have been added from Meneguzzo et al. (2021). Based on these 18 cases, two types of contexts where FT initiatives can take place are identified: (i) Site: a delimited, demarcated forest area, equipped and managed, with circuits with tracks, generally with irregular ring, that is closed circuit; (ii) Pathway: a track that develops in an open area through a natural wooded environment or a mixed one (from wooded to grazing, etc.), which may be equipped, where the start point is other than the end point.

Depending on the environment where FT initiatives are carried out two site typologies can be distinguished: (i) Forest therapy (FT) sites in a natural forest environment context; (ii) Urban forest therapy (UFT) sites of environmental or anthropogenic origin with characteristics that can be traced back to a forest but located in peri-urban or urban contexts (parks, botanical gardens, green areas of hospital, schools, etc.).

All selected parameters were sorted by themes, fields, and items, as shown and explained in detail in the result section.

Results

As mentioned above, the aim of the work is to propose a possible institutional *iter* for the assessment and validation of the FT/UFT site suitability through the submission of Technical Information Sheets (TIS) containing the necessary information on the sites' characteristics. TIS must be provided by applicants and assessed by competent authority.

The site suitability validation iter

This process begins when the proponent of a FT or UFT site wishes to obtain the official recognition of site suitability, *i.e.*, the

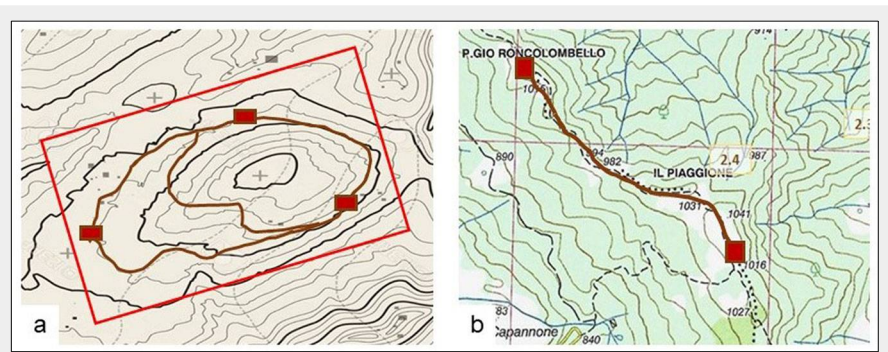


Fig. 1 - (a) Site, with ring track and station to stop; (b) Pathway.

therapeutic environment status and provides the basic information useful for carrying out an objective assessment of the candidate site. To this purpose, the proponent must submit the request through an application form to the Italian competent authority (regional or national), by filling out the TIS (see above) with all the detailed information necessary for the complete analysis of the environment. After receiving the filled TIS, the designated authority would process the application on a stepwise basis (Fig. 1). The first step is the preliminary analysis of the information given in the TIS, together with a remote check, to verify the reliability of the data carried out by bibliography information's and with the help of auxiliary data of thematic digital maps (DEM, topography, protection regulation,

etc.). In case of negative outcome, the application is rejected with motivation. Here two possibilities are considered, depending on the reasons of rejection and the possibility of modifying/adjustment. If the reasons for the rejection are “adjustable” (e.g., unsuitable routes in terms of length or width, missing services, etc.), the proponent can submit a new assessment request after the changes have been implemented. Otherwise, if the unsuitability of the site or pathway is due to structural conditions that cannot be modified (e.g., excessive noise or excessive slope, etc.), the request will be definitely rejected, and the location is excluded. Fig. 2 is a representation of the site suitability validation *iter*. In case the application form is deemed eligible, the authority may proceed to the second step.

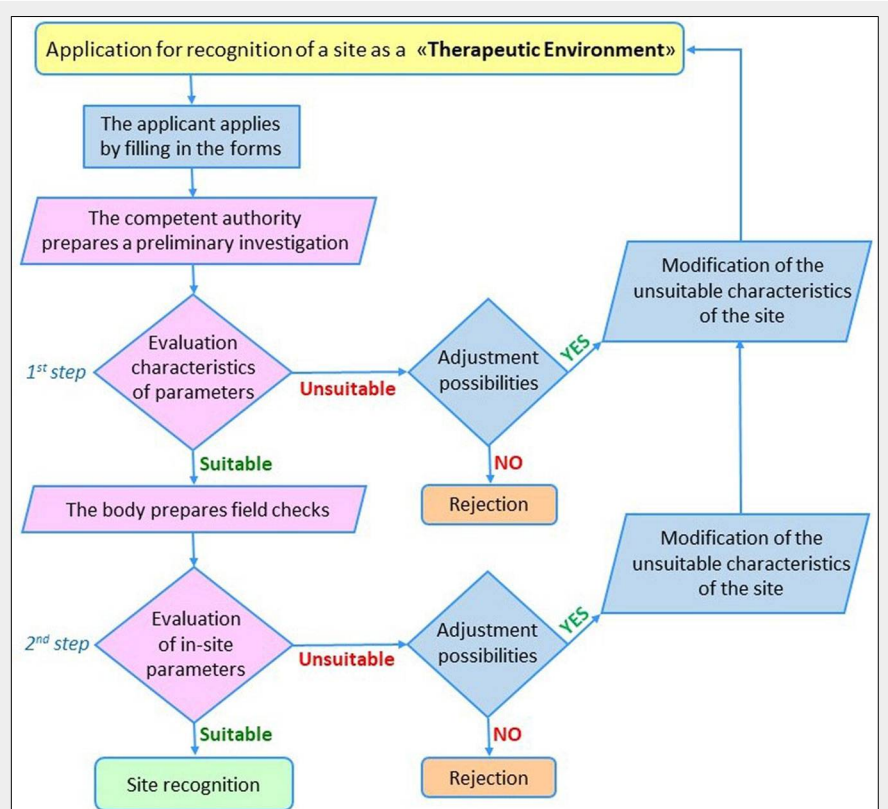


Fig. 2 - Flow chart of the *iter* (or process) of the accreditation of a site suitability of a Forest / Urban Forest Therapy project by the submission of application forms. Based on our own elaboration.

Tab. 1 - Technical Information Sheets 1: Identification registry for a site/pathway where Forest Therapy or Urban Forest Therapy activities is proposed. Based on our own elaboration.

1. Identification registry					
General Info	Project Promoters	Name of the legal delegate of the project		Name	
	Forest therapy	Natural forest environment		yes/no	
	Urban forest therapy	Environment referable to a forest or forest-like located in peri-urban and urban areas contexts (e.g. public or botanical gardens, etc.).		yes/no	
	Name of the owner or holder by type of ownership	Public			Name(s)
		Private			Name(s)
Collective				Name(s)	
Others				Name(s)	
Site	Location	Place, Municipality, Province		Name(s)	
	Extent of area (site) by type of ownership	Public			m ²
		Private			m ²
		Collective			m ²
		Others			m ²
		Total			m ²
	Internal paths	Number			Number
		Total length of paths within the area			m/km
	Geographic coordinates web Mercator (EPSG 3857)	Site-centre coordinates (Sc)			Coordinates
		Coordinates of main access points (S1, S2, etc.)			Coordinates
	Regional Technical Map (1:5000)	ID Code			Number
Cadastral map	Land registry references			Number	
Pathway	Location	Start of the route	Place, Municipality, Province	Name(s)	
		Route arrival	Place, Municipality, Province	Name(s)	
	Total length of the route divided by property type	Public			m/km
		Private			m/km
		Collective			m/km
		Others			m/km
		Total			m/km
	Route typology Ministerial Decree n. 563734 of 28/10/2021 "Forest and forestry and silvo-pastoral roads".	(a) Primary main roads: road infrastructure with a carriageway of 3.5 to a maximum of 6 metres.			m/km of the total
		(b) Secondary main roads: road infrastructure with a carriageway width of 2.5 to 3.5 metres			m/km of the total
		(c) Permanent minor roads of paths and tracks with a carriageway width of no more than 2.5 metres and a natural surface.			m/km of the total
Geographic coordinates web Mercator (EPSG 3857)	Starting Point Coordinates (SPC)			N, E	
	Coordinates of landmarks along the route (e.g., P1, P2, ...)			N, E	
	Arrival Point Coordinates (APC)			N, E	

This entails specific on-site investigations, through a special technical-scientific evaluation undertaken by independent experts with proven experience in forestry. Here there are two possible outcomes again. If the evaluation is positive, the site or path will be declared suitable for all purposes. If the assessment is negative and the grounds for exclusion can be changed, a new application may be requested, and the needed adjustment should follow. Otherwise, the location must be definitively excluded.

At the end of this second step, in case of positive assessment, the area can be officially recognized as suitable to host a FT initiative, and a monitoring system can be provided within the management plan of

the site area (e.g., Forest Assessment Plan) to verify the maintenance of the recognized suitability over time.

Site information and requirements in the Technical Information Sheets

The TIS are drawn up to identify and qualify sites on the basis of technical and scientific parameters regarding features and characteristics of the station (site or pathway), the landscape, the ecology, the vegetation, and the anthropic traits. These depend on location, morphology, the specific composition of the forest stand, its age, structure, stage of development, type of forest management, including the presence and characteristics of the road network for the use of the area. The TIS are di-

vided in four themes: (1) Identification; (2) Management; (3) Accessibility and Use; (4) Protection regulation. The first sheet (Identification – Tab. 1) summarises all the information (32 items) needed to identify the property and to classify the proposed therapeutic initiative (FT or UFT). The first block of information needs to be provided in any case, the other information depending on whether it is a "Site" or a "Pathway".

The second sheet (Management – Tab. 2 and Tab. 3) collects most of the data needed and is broken down into two different parts or themes of investigation: "A. Geomorphological and Landscape Features" and "B. Ecological and Vegetation Features". These sheets include informa-

Tab. 2 - Technical Information Sheets 2a: Management. Geomorphological and landscape features for a site/pathway where Forest Therapy or Urban Forest Therapy activities are proposed. Based on our own elaboration. Interior: inside the area site or within 50 metres on each side of the path. Exterior (visible): outside the area site or along the path.

2. Management - 2A. Geomorphological and landscape features				
Morphology	Altitude	highest point	m a.s.l.	
		Midpoint	m a.s.l.	
	Slope	lowest point	m a.s.l.	
		Media	%	
	Exposure	Maximum	%	
		Average	degrees from 0° N	
Outcropping rocks	Prevailing	degrees from 0° N		
	Outcropping area/total area	%		
Naturalistic elements	Waterways	Permanent	Interior	Exterior (visible)
			number	number
	Seasonal	m	m	
		number	number	
	Lakes	Number	m	m
			total surface area	number
Other elements	Waterfalls	m ²	m ²	
		Viewpoints	number	number
		(specify)	number	number
Anthropic elements	Historical buildings (e.g. castles, bridges, etc.)		number	number
	Traditional and historical artefacts (e.g. terracing, dry-stone walls, etc.)		number	number
	Modern infrastructure (e.g. buildings, wind farms, high-voltage pylons, ski lifts, bridges, viaducts, etc.).		number	number
	Other (specify)		number	number
Territorial context	Forest		%	%
	Pasture meadows		%	%
	Seasonal agricultural crops		%	%
	Permanent agricultural crops (arboriculture, olive groves, vineyards, etc.)		%	%
	Urban area		%	%
	Peri-urban area (e.g. industrial areas, etc.)		%	%
Disturbing elements	Urban agglomerations up to 40.000 inhabitants		Place name	
			Distance (m/Km)	
	Urban agglomeration with more than 40.000 inhabitants		Place name	
			Distance (m/Km)	
	Quarries (active or disused)		Name	
			Distance (m/Km)	
	Landfills		Name	
			Distance (m/Km)	
	Airports		Name	
			Distance (m/Km)	
	Industrial areas or establishments		Name	
			Distance (m/Km)	
	Highways		Name	
			Distance (m/Km)	
	Other fast-flowing roads		Name	
		Distance (m/Km)		
Provincial roads		Name		
		Distance (m/Km)		
Local roads		Name		
		Distance (m/Km)		
Railway line		Name		
		Distance (m/Km)		
Other disturbing elements (specify)		Name		
		Distance (m/Km)		
Notes	Other additional useful information			

tion about the characteristics of the project area and its surroundings that may affect its usability from a visual and acoustic point of view, and information about air and/or water. The characteristics proposed as technical-scientific criteria for the two themes provide the most important information for an evaluation which is objective and guarantees the good quality of the ini-

Tab. 3 - Technical Information Sheets 2b: Management. Ecological and vegetation features for a site/pathway where Forest Therapy or Urban Forest Therapy activities are proposed. Based on our own elaboration. Site: inside the area site or within 50 metres on each side of the path. Pathway: outside the area site or along the path out of 50 metres.

2. Management - 2B. Ecological and vegetation features		Site	Pathway
Vegetation species	List of tree species	name	name
		% of presence	% of presence
	Shrub species list	name	name
		% of presence	% of presence
	Herbaceous species list	name	name
		% of presence	% of presence
Percentage of forest cover	Ratio of forest area to total area	%	%
Distribution of the tree component	Areas with more than 20% tree cover along the route	%	%
	Open areas along the route	%	%
	More	%	%
Large live trees	Plants with a diameter at breast height (DBH) >50 cm	number	number
		prevailing species	prevailing species
	Presumed age of the oldest specimen	years	years
Deadwood and decaying wood	Presence of live habitat trees/veteran trees (DBH >50 cm, with cavities constituting habitats for fauna - birds, insects, etc.).	sporadic	sporadic
		widespread	widespread
		abundant	abundant
	Presence of standing dead habitat trees/veteran trees (DBH >50 cm)	sporadic	sporadic
		widespread	widespread
		abundant	abundant
	Presence of dead wood on the ground (similar size to standing trees)	sporadic	sporadic
		widespread	widespread
		abundant	abundant
Phytopathologies	Type	name	name
Vegetation mapping	At a scale of 1:10.000 or other detail	yes/no and scale number	yes/no and scale number
Management/assessment plan	Type of plan (e.g. Forest Management Plan or equivalent instrument, Green Management and Maintenance Plan, etc.).	valid (expiry date)	valid (expiry date)
		expired (date)	expired (date)
		in drafting stage	in drafting stage
		absent	absent
Additional historical information	Last management and/or harvest activities	year	year
		typology	typology
		Concerned area	Concerned area
	Last anthropogenic or natural disturbance of which there are evident traces (fire, grazing, illegal cutting, litter picking, collection of dry plants, extensive crashes, landslides, etc.).	year	year
		typology	typology
		Concerned area	Concerned area
Silvicultural systems	Forest	%	%
	Coppice	%	%
	Mixed	%	%
	Other (e.g., arboriculture, garden, botanical garden, etc.)	%	%
Main forest category	Physiognomic unit based on the dominance of one or more building species (e.g., chestnut, beech, peccary, hornbeam oak, pioneer invasion thickets, etc.).	name	name
Main forest type	Characterization of the homogeneity of flora, station, dynamic trends and, silvicultural and management trends (where appropriate)	name	name
Fauna	Presence of wildlife (e.g., identified animals)	Species	Name
	Presence of free-range farm animals	Species	Name

Tab. 4 - Technical Information Sheets 3: Accessibility and Use sheet, for a site/pathway where Forest Therapy or Urban Forest Therapy activities are proposed. Based on our own elaboration. Site: inside the area or within 50 metres on each side of the path. Pathway: outside the area site or along the path out of 50 metres.

3. Accessibility and use		Site	Pathway		
Accessibility	Main road	Name	Name		
		Distance to access (m/Km)	Distance to access (m/Km)		
	Parking	Name	Name		
		Distance to access (m/Km)	Distance to access (m/Km)		
	Public bus	Line name	Line name		
		Useful stopping distance (m/Km)	Useful stopping distance (m/Km)		
	Train	Line name	Line name		
		Site distance (m/Km)	Site distance (m/Km)		
	Specific transport	Starting point	Starting point		
		Place name	Place name		
Practicability	Path(s)	number	number		
		Total length (m/km)	Total length (m/km)		
	Pavement of path(s)	Natural	m/km	-	
		Reinforced	m/km	-	
Accessible for the disabled	yes/no	yes/no			
Usability	Facilities	Equipped refreshments	number	number	
		Reception/ticket office	yes/no	yes/no	
		Bivouac	number	number	
		Managed refuge	number	number	
		Infirmary	yes/no	yes/no	
		More	(specify)	(specify)	
	Equipment	Benches	number	number	
		Tables	number	number	
		Drinking fountains	number	number	
		Information Signage	number	number	
		Educational Signage	number	number	
		First aid kit	yes/no	yes/no	
		Defibrillator	yes/no	yes/no	
		Wi-Fi network	yes/no	yes/no	
		Other (specify)	number	number	
		Specialised personnel	Companion	number	number
			Medical/nursing	number	number
			Other (specify)	number	number
		External Structures	Hospital or medical facility	Distance (m/Km)	Distance (m/Km)
Nearby accommodation (specify: B&B, Hotel, etc.)	Distance (m/Km)		Distance (m/Km)		
Upcoming restaurants	Distance (m/Km)		Distance (m/Km)		
Notes	Other additional useful information	-	-		

tative. The compilation of this section implies technical knowledge that can only be obtained by professional experts (e.g., agricultural or forest scientists) through field analyses and the study of the Forest Assessment Plan. The theme A (Geomorphological and Landscape Features) investigates five specific fields: Morphology, Naturalistic elements, Anthropogenic elements, Territorial context, and Disturbing elements. The 28 items refer to the elements visible both externally and internally to the perimeter of the site or pathway. In particular, it is important to know the average distance (in metres) from possible important anthropogenic polluting structures, such as

built-up areas, busy highways, industrial and craft workshops, sewage treatment plants, etc. These elements could influence the quality of the proposed services and their distance from the site or pathway have to be considered in relation to prevailing wind regimes that might transport pollutants to the site. However, the presence of forest belts, placed to create an adequate barrier of several km between the site of interest and the sources of pollutants, can represent an effective obstacle for pollutants before they reach the site. In the Theme B (Ecological and Vegetation Features) 25 items are included, grouped in 12 fields: Vegetation species, Percentage of

forest cover, Distribution of the tree component, Large live trees, Deadwood and decaying wood, Phytopathologies, Vegetation mapping, Management/assessment plan, Additional historical information, Silvicultural systems, Main forest category, Main forest type, Fauna. Here there are the most important parameters (type of tree, shrub and herbaceous species, specific composition, age of the trees, etc.) for the evaluation and identification for the therapeutic services that can potentially be provided. In this context, the availability of a georeferenced tree census for the candidate area is particularly useful. Such a tool is part of modern Forest Management

Plans and can be carried out through remote sensing LiDAR or ground tree inventory for trees with a diameter of more than 50 cm, conducting a hypsometric survey and recording the projection of tree crowns on the ground. All this makes it possible to assess the tree cover density, which could be a discriminating element depending on the purpose of the activity. In general, regardless of the quantity of species, sufficiently open and bright forests are recommended. It is also important to detect the presence of any “alien species”, extraneous to the ecological context of the area. For an exhaustive list of alien species, the database of the Italian Botanical Society’s Invasive Species Working Group and its publications could be considered (Ministry of Ecological Transition). The recent EU Regulation on the management of newly invasive species (Reg. No. 1143/2014/EC - European Parliament 2014) should also be considered. In addition, the presence of species that are toxic to touch or have poisonous parts must be considered. It is important to know the vegetation evolution of the species (tree and shrub species) as well as the emission into the air of volatile compounds and pollen, depending on the season. The protection of personal health cannot ignore considerations about respiratory well-being, and therefore the control of “best periods of forest use”, in relation to individual sensitivities to allergenic pollens. Then the evaluator should consider the potential allergenic index of the most representative species with medium

to high allergenicity. Based on the possible presence of forest cover data, the Index of Urban Green Zones Allergenicity (IUGZA) of the forest phytocoenosis will be calculated, where possible, assuming a standard cover, in order to establish a gradient of potential allergenicity of the various phytocoenosis. A seasonal pollen calendar must be drawn up, based on available data collected by the Italian Aerobiology Association and the Regional Environmental Agencies, for the main allergenic families including native Italian tree species (*Betulaceae*, *Corylaceae*, *Oleaceae*, *Cupressaceae*). Of particular importance is also the presence and level of spread of plant diseases, which must be periodically verified and monitored, as they could compromise health and create potential safety hazards for individuals. Finally, information is required on the current silvicultural system, categories and types of forest. This information can be found in scientific bibliography or reported in the Forest Management Plans of the area. Particularly important is the availability of the Forest Management Plan for forest sites and the Management and Maintenance Plan for sites in areas such as gardens, botanical gardens, etc. The management plan is critical for a site designated to FT or UFT to plan the operations needed to guarantee good health and usability of the site over time. Forest management for a proper site maintenance can improve the resilience of the environment, by overcoming possible natural or anthropic disturbance factors, that could al-

ter the ecosystem services it provides.

The third sheet (Accessibility and Use – Tab. 4) proposes five specific fields: Accessibility, Practicability, Usability, External Facilities and Additional Information. The 13 items relate to the transport and logistics infrastructures, to the actual accommodation and any other infrastructures facilitating the use of the site or pathway, as well as the opportunities for developing therapeutic initiatives. A site needs to be easily accessible, therefore distances longer than 500 metres and paths with a high degree of difficulty should be avoided. Slope, difference in altitude between departure and arrival points, length, accessibility from the main road and exposure can influence the pathways, which should not require significant physical effort. *Ad hoc* experiences for people with disabilities can also be planned within a site or pathways, which can also be enjoyed by the able-bodied, in an overall time not exceeding one hour. Longer distances can also be provided for the pathways, including at least one overnight stay in a refuge or equipped accommodation in the forest.

The fourth sheet (Protection regulation – Tab. 5) includes two specific fields: Protected areas, and Risks and Constraints. Here there are 9 items and it is required to indicate if the area is subject to specific environmental constraints. This information represents an important point of reference for understanding the management and improvement limits that have to be respected (e.g., protected areas), as well as

Tab. 5 - Technical Information Sheets 4: Protection regulation, for a site/pathway where Forest Therapy or Urban Forest Therapy activities are proposed. Based on our own elaboration. Site: inside the area or within 50 metres on each side of the path. Pathway: outside the area site or along the path out of 50 metres.

4. Protection regulation			Site	Pathway	
Protected Areas	National Park (name)		m ²	m	
	Regional Park (name)		m ²	m	
	Natural reserve (name)	Integral		m ²	m
		Oriente		m ²	m
		Specials		m ²	m
		Biogenetic		m ²	m
	Wetlands	(name)	m ²	m	
	Other protected areas (name)	Regional Protected Natural Areas,		m ²	m
		Natural monuments,		m ²	m
		Suburban parks,		m ²	m
		Provincial parks,		m ²	m
		Oases of environmental associations		m ²	m
	Natura 2000 Network (name)	Site of Community Interest (SCI)		m ²	m
Special Protection Area (SPA)			m ²	m	
Special Area of Conservation (SAC)			m ²	m	
UNESCO sites		m ²	m		
Restrictions and risks	Landslide risk	Category name	m ²	m/km	
	Hydraulic risk	Category name	m ²	m/km	
	Landscape restriction	Category name	m ²	m/km	
	Other existing restrictions or risks (detailed descriptions providing useful information not foreseen in the sheet)		-	-	

the risks that the constrained area might suffer from, or that users might encounter.

Discussion and conclusion

In Italy, as well as in most other countries, there is a lack of regulatory framework relating FT and relative activities, which lead the proliferation of locations and non-professional initiatives. This study contributes to fill this gap, proposing the development of standards for the recognition of FT/UFT sites. The official recognition by public institutions is critical to provide a public health service to the society, which considers disease prevention as increasingly important. The standard procedure described in the study is based on the analysis of technical and site-specific criteria required to evaluate when a site is suitable for FT/UFT as treatment sites. The proposed *iter* can represent the base for a regulation of sites where FT/UFT activities are carried out, so that high quality health services through FT/UFT can be provided. This procedure builds upon the use of TIS to assess forests and their environmental characteristics. Indeed, each area has its own specific forestry features and properties, accommodating and performing specific functions suitable for target subjects/groups or activities (Bach Pagès et al. 2020). In this paper the distinction between FT and UFT have been stressed. Forests in urban environments are very important but they have different advantage and disadvantages to the locations in extra-urban and more natural environments. Forests in urban context suffer from a greater number of stresses for vegetation and disturbing factors (noise, pollution, etc.), but they are more easily accessible and can therefore be more frequently enjoyed by a larger share of population. This is particularly important considering the ongoing urbanization process, which brings to the increase in psychophysical stress and other non-communicable diseases in the urban-dwelling population related to sedentary lifestyles and mental illness, and consequently an increase in health costs that FT/UFT initiatives can contribute to reducing. The evaluation and recognition of site suitability needs to be carried out by local authorities, accordingly to the national political-legal framework oversees forests and the overall forestry sector. Indeed, any productive or recreational projects on forest land always need to be authorized by the regional administration to comply with regulation relating to environmental protection, risks areas (e.g., hydraulic or landslide risk). Of course, the recognition of FT site suitability must be updated and verified periodically: it is essential that all the requirements are met not only at the time of submission of the application for eligibility but also over time, according to the provisions defined in the regional forest management programme and planning tools. For this purpose, a Site Management Plan (or equivalent instrument) must be produced to identify

how the forest and stationary characteristics, which are relevant to the intended therapeutic activity, will be maintained in the short and long term. This is ensured by the definition and planning of silvicultural interventions, that also aimed at protecting the natural capital and enhancing ecosystem services, according to the current environmental regulation. The present study is part of the activities envisaged by an agreement signed by a broad partnership (memorandum of understanding between the parties) composed of research institutions, universities, and public administrations, including the Italian Ministry of Agriculture, Food Sovereignty and Forests (<https://www.reterurale.it/terapiaforestale/contatti>). The project partners are currently developing an online platform as a reference for the census of all the FT/UFT sites in Italy (<https://www.reterurale.it/terapiaforestale/retenzionale>). This is another contribute to supporting FT initiatives in Italy, making them more visible and institutionalized. A public database could be useful to collect all the information of the FT suitable sites at national level, adding data regarding the most important features of the site (type of sites, use, etc.). Another important output of this agreement is the definition of specific methodologies to be used for the analysis and classification of the therapeutic characteristics in each site and their benefits for users. In fact, once the site is recognised as suitable from a forest perspective, other two more steps are necessary. Firstly, an on-field evaluation of the quality atmosphere (e.g., concentration of volatile organic pollutants) and properties (e.g., concentration of monoterpenes emitted by plants) of the site is required. This inspection should be performed by authoritative scientists and specialists belonging to governmental research bodies and validated by the Superior Health Institute. The characterization of the forest atmosphere determines the specific vocation of different forest types and the “therapeutic specialization” of the site. Moreover, it is necessary to consider that the therapeutic function cannot ignore the connection between silvicultural and medical sciences (Oh et al. 2020). Secondly, the site would be related to different disorders or diseases (anxiety, depression, etc.) in order to provide an effective therapeutic service, and become the base for guidelines according to an institutional regulation. The site should be used for target groups on the basis of a medical prescription by therapist scientists (psychologists, psychiatrists).

FT and UFT initiatives can be considered amongst the new frontiers of preventive and curative medicine in the same way as thermal treatment. The recognition of the Italian sites and the activities could lead to future “green prescriptions”, as it happens in few other countries such as Korea (Nabhan et al. 2020). Furthermore, it might represent a concrete and useful means of

relieving the National Health System in terms of costs. Last but not least, it could be an interesting opportunity for the local development and employment, in both inland rural areas and urbanised contexts. The main business opportunities are related to the creation of new professional profiles (such as guides for the sites), the increasing of hospitality, and to the sustainable forest management of dedicated sites (Bachinger & Rau 2019, Dodev et al. 2020). This is especially true in a country like Italy where forests cover more than 36% of its land area (Gasparini et al. 2022), where under 15% of the national population live and only 16% of the forest area has a Forest Management Plan. Finally, FT can also represent a chance to revitalize the forestry sector, which is increasingly focused on multifunctionality and the provision of ecosystem.

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