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The Digitalization Framework of the National Forest System at 2020

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Abstract: The digitalization of processes is a priority objective on the agenda of the National Government. The forestry system could benefit from its introduction, both for the purposes of administration, management, monitoring and governance of the national forest heritage. The authors, through questionnaires and interviews, defined the degree of digitalization of the forestry sector. While the computerisation phase has been completed, at the beginning of 2021, forest digitalization is yet in the early stages, except for some realities that represent excellence.

Keywords: Innovation and communication technologies; Digitalization Indexes; Digital tools; Ri.Selv.Italia Project; Data dispersion

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1. Introduction

Digitisation has become an indispensable opportunity especially for public institutions and businesses that are using it to improve efficiency in service delivery and simplify access. The use of digital tools is crucial for the continuous monitoring of the environment and ecosystems, for the large-scale sharing of environmental data, their processing and dissemination at different spatial scales, and for increasing the effectiveness of environmental governance. Despite this, there is currently a complete lack of georeferenced structural data on forest areas affected by degradation processes, data on woody and non-woody forest production, data on infringements and other data on ordinary forest management. The absence of the digital forestry system has strong repercussions both in terms of the failure to quantify the role of national forests in the context of environmental issues and in supporting institutional forest governance.

2. Material and Methods

The study involves the forest administrations of the Autonomous Regions and Provinces (R&PA). Information was acquire with consultation of the R&PA websites, forestry section and direct interviews with the managers and/or their delegates of the Forestry Offices at the R&Pas. For the analysis of the websites, a preliminary activity was carried out, followed by operational activity. The preliminary phase involved identifying what services users would expect to find on forestry web pages. In the operational phase, the various R&PA web pages were viewed, filling in the table according to the 'present (=1)/absent (=0)' metric for each R&PA. The interviews were mainly conducted with managers and/or their delegates. The topic covered the integration of digitisation of forestry

administrative processes, focusing on existing digital tools and initiatives as of 2020. The metric 'present (=1)/absent (=0)' was also adopted in this segment.

The procedure involves the calculation for each R&PA of the partial absolute degree, as the sum of the positive values recorded for the subjects of the topic and partial relative degree, as the ratio of the absolute degree to the number of subjects included in the topic. As far as the level of digitisation is concerned, the proposed models express an assessment with respect to the national scale system in its entirety. Since the level had to be defined for the forestry sector alone and the regional scale was considered, iconic instruments representative of the various I&D levels were identified. An I&D matrix was constructed for levels and categories (Table 3), with levels that represent the progress made in digitisation (6 levels progressively increasing from 0 to 5, of which the first three are computerisation levels and the next three are digitisation levels) and categories (No 3) and their sub-categories (No 11) are the innovative digital functions and services progressively introduced into the I&D system.

Six significant forestry themes were then selected and the iconic digital functions and services that theoretically best fulfilled that service or function were identified. The icon associated with the topic, identifies the level of I&D progress achieved, which is taken as the value entity of the digitisation level. For each R&PA, the detected metrics were multiplied by the value entity of the icon. Subsequently, the sum per line of the values obtained related to the sum of the levels of the various icons, resulting in the value identifying the digitisation level of each R&PA. At the conclusion of the multiplication of the '1/0' metric with the entity of value for all topics, the sum being related to the total entity of topic values, we have the level of each R&PA. The national level, on the other hand, was calculated as the sum of the entities of the thematic values of all R&PAs, related to the number of R&PAs. The national result of each theme was related to the sum of the levels of the various icons, resulting in the national level.

Table 1. Outcomes of institutional website navigation.

Regions and Provinces	Comunication					Forestry Administration				Governance		
	Forest Heritage	Monumental Plants List	Forestry System	Laws and Regulations	Forest Administration Organization	FAQ	Links to Forestry Offices	Access to Digital Forms	Access to Forest Cartography	Initiatives for Forestry Sector	List of Forest Companies	Forestry Statistics
VDA	1	0	1	1	1	0	0	1	1	1	1	0
PMT	1	1	1	1	1	1	1	1	1	1	1	1
LMB	1	1	1	1	1	1	1	1	1	1	1	0
PAdTN	1	1	1	1	1	0	1	1	1	1	1	1
PAdBZ	1	1	1	1	1	1	1	1	1	1	0	1
VEN	1	1	1	1	1	0	1	1	1	1	1	0
FVG	1	1	1	1	1	0	0	1	1	1	1	1
LGR	1	1	1	1	1	0	1	1	1	1	1	0
ERG	1	1	1	1	1	0	0	1	1	1	1	1
TSC	1	1	1	1	0	0	1	1	1	1	1	0
MRC	1	1	1	1	1	0	1	1	1	1	1	0
UMB	1	1	1	1	1	0	1	1	0	1	1	0
LAZ	1	1	1	1	1	1	1	1	1	1	1	0
ABR	1	0	1	1	0	0	1	1	1	1	0	0
MLS	1	0	1	1	1	0	1	1	1	1	0	0
CMP	1	1	1	1	1	0	1	1	0	1	1	0
PUG	1	1	1	1	1	0	1	1	0	1	0	0
BSL	1	1	1	1	1	0	1	1	0	1	1	1

CLB	1	1	1	1	1	0	1	1	1	1	1	0
SCL	1	1	1	1	1	0	0	1	1	1	0	0
SRD	1	1	1	1	1	0	1	1	0	1	0	0

Table 2. Outcomes of the semi-open interviews.

Regions and Provinces	Modalities for Submit Projects/Plans	Digital Forms	Data Management	User Accreditation	Digital Signature of the Project	Digital Forestry Platforms
VDA	**1**	**1**	**1**	**0**	**0**	0
PMT	1	1	1	1	1	1
LMB	1	1	1	1	1	1
PAdTN	1	1	1	0	1	0
PAdBZ	1	1	1	0	1	0
VEN	1	1	1	1	1	1
FVG	1	1	1	1	1	1
LGR	0	1	1	0	0	0
ERG	1	1	1	1	1	1
TSC	1	1	1	0	0	1
MRC	0	1	1	0	0	0
UMB	1	1	1	0	1	0
LAZ	1	1	1	0	1	0
ABR	0	1	1	0	0	0
MLS	0	1	1	0	0	0
CMP	1	1	1	0	0	0
PUG	0	1	1	0	0	0
BSL	0	1	1	0	0	0
CLB	0	1	1	0	0	0
SCL	0	1	1	0	0	0
SRD	0	1	1	0	0	0

Table 3. Matrix of the evolution of IT-digital tools.

Categories	Sub-categories	Informatization		Digitalization			
		0	**1**	**2**	**3**	**4**	**5**
General Profiles	Instrumental Equipment	IBM PC/Commodore 64	Computer, Inkjet Printer, Fax	Networked Computer, Multifunction Printer	Networked Computer, Multifunction Printer	Networked Computer, Multifunction Printer	Networked Computer, Multifunction Printer
	Telematic Infrastructures	Not Available	Analogue Mobile Telephony	Digital Telephony	ADSL; 3G	Wi-fi; 4G	5G
	Data Storage	Paper	Floppy disk	CD/DVD	USB; hard disk drives	Cloud	Shared Cloud
	Communication	Mail	E-mail	E-mail	E-mail + Certified E-mail	E-mail + Certified E-mail	E-mail + Certified E-mail

	Document Tracking	Protocol	Paper Administrative Protocol	Computerized Administrative Protocol	Digital Protocol	Digital Protocol	Digital Protocol
	User Accreditation	Document	Photocopy of Document	Username + Password	Authentication	Authentication with Basic Levels of Security	Authentication with multiple levels of security (SPID)
Public Administration Profiles	Formal Communication	Mail	Mail	Mail	Certified E-mail	Certified E-mail	Certified E-mail
	Document Format	Paper	Paper	Paper	Dematerialization	Dematerialization	Dematerialization
	Forms	Paper Form	Guidance Paper Form	Downloadable and Fillable Paper Form	Downloadable and Fillable Paper Form	Predefined and digital forms	Predefined and digital forms
Professional Profiles	Cartographies	Trace on Transparent Sheets	Photocopies	GIS	WEB-GIS	WEB-GIS	WEB-GIS with Open Source Software
	Submission of Professional Works	Mail	Mail	E-mail + Certified E-mail	Sending Files by Certified E-mail	Sending Files by Certified E-mail	Processing on a Digital Platform

3. Results

Only one Region responds positively to all topics with an absolute partial degree of 12, while the others record decreasing values down to a minimum absolute partial degree of 7. It follows that the relative partial degrees have a range between 0 and 1, with the Piedmont Region recording the highest relative partial degree of 1, while the lowest is the Abruzzo Region's 0.58. Turning to the partial degree of the semi-open interviews, no less than four regions show the highest absolute degree, while the most frequent degree is recorded in eight regions of Central and Southern Italy.

The aggregate degree of digitisation (website analysis and interviews) is shown in Table 4.

Table 4. Absolute and relative degree of digitisation of R&PAs and Italy.

Regions/Provinces	Degree		Regions/Provinces	Degree	
	Absolute	Relative		Absolute	Relative
VDA	11,00	0,61	UMB	14,00	0,78
PMT	18,00	1,00	LAZ	16,00	0,89
LMB	17,00	0,94	ABR	9,00	0,50
PAdTN	15,00	0,83	MLS	10,00	0,56
PAdBZ	15,00	0,83	CMP	12,00	0,67
VEN	16,00	0,89	PUG	10,00	0,56
FVG	16,00	0,89	BSL	12,00	0,67
LGR	13,00	0,72	CLB	12,00	0,67
ERG	16,00	0,89	SCL	10,00	0,56
TSC	13,00	0,72	SRD	11,00	0,61
MRC	13,00	0,72	ITA	13,29	0,74

Table 5 shows the levels of the icons, where R&PAs have introduced them, as well as the absolute and relative levels recorded by individual R&PAs. The absolute levels range between 4 and 0.67.

Table 5. Levels of digitisation in the Regions, Autonomous Provinces and Italy.

	Digital Icons of Functions and Services							
	Sending Files by Certified E-mail	Predefined and digital forms	Authentication with levels of security (SPID)	Dematerialization	WEB-GIS	Cloud		
	3	4	5	3	5	4		
Regions/Provinces	Modalities for Submit Projects/Plans	Digital Forms	User Accreditation	Digital Forestry Platforms	Digital Forest Cartography	Forestry Statistics	Levels	
							Absolute	Relatives
VDA	3,00	4,00	0,00	0,00	5,00	0,00	12,00	2,00
PMT	3,00	4,00	5,00	3,00	5,00	4,00	24,00	4,00
LMB	3,00	4,00	5,00	3,00	5,00	0,00	20,00	3,33
TN	3,00	4,00	0,00	0,00	5,00	4,00	16,00	2,67
BZ	3,00	4,00	0,00	0,00	5,00	4,00	16,00	2,67
VEN	3,00	4,00	5,00	3,00	5,00	0,00	20,00	3,33
FVG	3,00	4,00	5,00	3,00	5,00	4,00	24,00	4,00
LGR	0,00	4,00	0,00	0,00	5,00	0,00	9,00	1,50
ERG	3,00	4,00	5,00	3,00	5,00	4,00	24,00	4,00
TSC	3,00	4,00	0,00	3,00	5,00	0,00	15,00	2,50
MRC	0,00	4,00	0,00	3,00	5,00	0,00	12,00	2,00
UMB	3,00	4,00	0,00	3,00	0,00	0,00	10,00	1,67
LAZ	3,00	4,00	0,00	3,00	5,00	0,00	15,00	2,50
ABR	0,00	4,00	0,00	0,00	5,00	0,00	9,00	1,50
MLS	0,00	4,00	0,00	0,00	5,00	0,00	9,00	1,50
CMP	3,00	4,00	0,00	0,00	0,00	0,00	7,00	1,17
PUG	0,00	4,00	0,00	0,00	0,00	0,00	4,00	0,67

BSL	0,00	4,00	0,00	0,00	0,00	4,00	8,00	1,33
CLB	0,00	4,00	0,00	0,00	5,00	0,00	9,00	1,50
SCL	0,00	4,00	0,00	0,00	5,00	0,00	9,00	1,50
SRD	0,00	4,00	0,00	0,00	0,00	0,00	4,00	0,67
ITA	1,71	4,00	1,19	1,29	3,81	1,14	13,14	2,19

4. Discussion

The survey of regional websites dedicated to the forestry sector in 2020 shows the presence of various services, some of which are common to all R&PAs such as the current legislative-regulatory framework, access to forms, and active initiatives in support of the forestry system, while progressively fewer R&PAs have included services for forest administration purposes and even fewer have included services useful for governance. The R&PAs that have a greater forestry tradition in which forests play an important socio-economic-environmental role, present pages that are up-to-date, articulate and overall rich in content (photos, videos, texts, boxes, etc.), with a clear location on the site map. On the other hand, the central-southern regions have more essential web pages, which are often dated, unattractive and poor in content. Within this framework, the degree of digitisation is defined in a range between 1.00 and 0.58, relative to the Piedmont and Abruzzo regions respectively. The former is due to the ability to provide efficient services on all topics, while the latter stems from the numerous gaps in both communication and forest governance. The results of the semi-open-ended interviews revealed two critical issues affecting the results. These are (a) the tendency to respond with respect to the current situation rather than the situation in 2020, and (b) the ability to distinguish between computerisation and digitisation. The latter can be deduced from the two topics for which all R&PAs claimed to work with digital tools: administrative forms and data management of plans and projects. In some interviews, the respondent's difficulty in distinguishing between computerisation and digitisation emerged. Whether the professional used the form downloaded from the site, filling it in manually and submitting it as a .pdf with holographic signature, or, sending it on paper transmitted by PEC, in both cases these were considered as digital processes. It is clear that we are in a sort of transitional period, in which there is the integration of digital tools in a context of computerisation, where digitisation would involve the collection of data on a personal device and its transfer to the digital platform after access by digital accreditation of the user. It is believed that these critical issues may have led to an overestimation of the degree and level of digitisation in the forestry sector. It was not possible to use established methodologies to calculate the degree and level of digitisation of the forest system. That proposal appears to be satisfactory overall, however it is felt that the results achieved overestimate the digitisation of the national forestry system.

5. Conclusion

In the low level of digitisation of the forestry sector, concauses such as the conservative character of the operators in the sector, the exclusive competence of R&PA in forest management with a profoundly different forestry socio-economic framework, as well as the institutional superstructure that derives from the multifunctionality of forests, probably point to concauses. The result is a strong complexity in building a forestry digital system capable of ensuring high degrees and levels of digitisation. The proposed

methodology, while referring to the approach adopted by the United Nations and the European Union, had to anchor itself on information affected by digital illiteracy, as well as, the absence of established correlations between iconic tools and digitisation advancement levels. This leads to the assertion that an overestimation of the degree and level of digitisation is likely to have occurred, both at R&PA and national levels.

Three relevant features emerge in 2020 are that at the lower end of the national average degree of digitisation is the largest number of regions; the level of digitisation of the national forestry system is 2.24, i.e., it is below the average value on the scale from "0" to "5th" level; no R&PA reaches level 5. The achievement of level 5 is, in perspective, an unavoidable target. It cannot be met by the initiative of a single R&PA, but can be achieved when all R&PAs work together to make theirs accessible. The LIFE project "FOREST PLANNING AND EARTH OBSERVATION FOR A WELL-GROUNDED GOVERNANCE" (FOLIAGE), with the participation of two regions and the involvement of important forestry institutions, intends to promote the adoption of four dedicated digital forestry platforms with the objective of fully digitising the forestry sector in the partner regions.

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