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WEB ACCESSIBILITY OF SMALL ROMANIAN MUNICIPALITIES

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ABSTRACT: In the context of recent European regulations, the web accessibility of the public sector is a critical problem. In this respect, municipal websites should meet the requirements of web content accessibility guidelines (WCAG) by 2025. A recent study analyzed the first hundred Romanian municipalities, ordered by population, and found that most of them fail to meet WCAG requirements. Although a survey of literature shows many studies regarding the web accessibility of municipal websites, most of them are targeting the largest municipalities from a country. This paper reports an accessibility evaluation targeting the websites of the smallest 100 Romanian municipalities. The evaluation used two accessibility checking tools: Total Validator and Wave. The results indicate low web accessibility, with over 90% of websites failing to comply with the lowest WCAG accessibility level. A comparison with previous data shows several differences between large and small municipal websites. The findings also suggest that clear national regulations should be issued to meet the requirements of European accessibility directives.
KEYWORDS: web accessibility, small municipalities, WCAG2, accessibility checking tools

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1. INTRODUCTION

Improving the lives of people with disabilities – around one hundred million people have some form of disability – is the main goal of the European Disability Strategy for 2021-2030, which aligns with digital inclusion and aims to enable everyone to contribute to and benefit from the digital world (see: https://digital-strategy.ec.europa.eu/en/policies/web-accessibility).

In the context of the fast development of information services, web accessibility on public sector websites has become a critical problem that is reflected in several European regulations. Poor web accessibility is a barrier to people with visual impairment, limiting their access to online services. In Romania, by June 2024, there were 942.9 people with disabilities, out of which 84.6 thousand have visual impairment (https://mmuncii.gov.ro/statistici/).

The Web Accessibility Directive (WAD) of the European Parliament and Council aims to make the web of the public sector accessible for people with disabilities [1]. In this respect, municipal websites should meet the WCAG requirements by 2025.

Although the directive has been in force since 2016, an evaluation of the current status shows that only 16% of analyzed websites are fully accessible [2]. A recent study on the first hundred Romanian municipalities, ordered by population, found that most of them fail to meet WCAG requirements [3]. A similar situation is encountered in other countries, several studies showing that the accessibility level of European municipalities is low [4], [5], [6].

The European Accessibility Act (EAA) from 2019 applies to several electronic equipment and services, such as computers, operating systems, smartphones, e-commerce, e-books, banking, and ticketing, being in force since June 2025 [7]. Not only people with disabilities, but also other people experiencing functional limitations, like the elderly, would benefit.

Since member states should transpose EAA into national law by 2025, June 28, a government regulation already issued by the Romanian Authority for Digitalization (ADR) that specified a norm for monitoring accessibility in the public sector [8].

Although the existing literature shows several studies regarding the web accessibility of municipal websites, these are mainly targeting the largest municipalities from a country. Websites of small municipalities are often overlooked, although everyone should have fair access to information and services.

In the last decade, there have been few accessibility studies evaluating Romanian municipal websites, but these stopped at the first sixty [9] or first hundred websites [3]. The only large-scale accessibility evaluation in Romania targeted 186 websites of municipalities with more than 10000 inhabitants [10].

This paper reports an accessibility evaluation for visually impaired people, targeting the websites of the smallest Romanian municipalities. The evaluation

used two accessibility checking tools on a sample of 100 websites.

The following section presents some related work on the accessibility evaluation of municipal websites. Next, the methodology and the evaluation results are presented and discussed.

2. RELATED WORK

Manual evaluation of web accessibility is challenging and time-consuming, particularly for numerous websites. A widespread practice is to use computer tools that check the compliance with WCAG [11], thus enabling the evaluation of many websites with a reasonable effort. There are many such tools available that differ in terms of coverage, strengths, techniques, reporting, and limitations [12], [13], [14]. Most accessibility studies targeting public bodies are using accessibility checking tools.

Ara et al. surveyed the accessibility research literature from the perspective of the web evaluation process. They analyzed tool-based accessibility testing and evaluation in the decade 2010-2021 and found an increase in published studies after 2017 [15].

The study of Król and Zdonek [16] investigated the accessibility of 182 websites in Poland by using five accessibility checking tools: Wave, Lighthouse, Opera Mobile Emulator, Utilitia, and FAE. Their findings show that more than half of the websites were inaccessible and about 34% were significantly inaccessiblef or people with disabilities. On the other hand, they found that municipalities exhibit a degree of awareness as regards the importance of accessibility.

A similar study of Kous et al. [17] analyzed the web accessibility of Slovenian municipalities. They used a sample of 189 websites. Checking the accessibility before and after the adoption of the standard EN 301549, they found several improvements from 2017 to 2018.

Another longitudinal study, spanning three years, has been conducted by Inal and Torkildsby [4] to investigate the effect of new regulations on the accessibility of Norwegian municipal websites. They used the Wave checking tool and found continuous improvements, although the accessibility is still low.

The accessibility of Italian municipalities using the AChecker and VaMola tools has been investigated by Valtolina and Fratus [18]. Their findings show that accessibility is low, although many errors could be easily fixed.

Csontos & Heckl analyzed the usability and accessibility of Hungarian government websites over a period of five years and found that only 16% had no errors. Also, the most frequent errors in 2018 are still the most frequent in 2023, although the number of websites having these errors decreased [19].

Lynn et al. [20] investigated the accessibility of Irish local government websites. Using PowerMapper's OnDemand Suite on a sample of 31 websites, they found that most websites have accessibility problems. Similar results have been reported by Işeri et al.[21] , based on testing a sample of 67 municipal websites in Cyprus with EIII, Achecker, and Page Cecker tools.

The study of Angelico et al. [22] investigated the web accessibility of 86 Portuguese municipal websites. Using the AChecker tool, they found that more than 75% of the websites didn't comply with WCAG2 requirements, and most of the errors are related to the perceivability principle. Similar results have been found by Sanchez-Labella et al. [23], who analyzed the accessibility of Spanish municipal websites, based on a sample of 62 big towns.

The study of Nastiti et al. [24] used TAW and aXe checking tools to investigate the web accessibility of Indonesian provincial governments' websites. Their findings, based on a sample of 34 websites, showed that all have WCAG violations, especially related to the perceivability principle.

Recently, Ianuzzi et al. [25] reported on a large-scale evaluation of Italian public administration websites. Using a methodology and an associated tool (Mauve++), they checked the accessibility of over twenty-nine thousand websites. Findings showed that most violated accessibility criteria are related to information & relationships and contrast.

The accessibility study of Hristova [26] used Wave to evaluate 437 Bulgarian government websites and found that only a few of them comply with minimal WCAG 2 requirements. Widespread accessibility problems were: missing alternative text, missing labels, and missing link descriptions. Another recent study [27] analyzed the accessibility of municipal websites in Albania using AChecker on a sample of 37 websites and found that all have accessibility errors.

Wharton et al. [28] evaluated the accessibility of local authorities' websites in England. They used a heuristic evaluation method, testing three pages of 57 websites, and found that only 9 pages were error-free. Overall, councils' websites were 86% compliant with the test points.

A recent accessibility check of Romanian municipal websites used Achecker, Total Validator, and Wave

to analyze the first hundred websites, ordered by population [3]. The findings show low accessibility and little progress in the last ten years. Most frequent accessibility errors were the lack of a text description for a link, the lack of a text alternative for non-text content, the lack of labels for controls, and improper ordering of headings.

3. METHOD

WCAG 2 defines three levels of conformance: A, AA, and AAA, with A being the lowest [29]. The accessibility model is based on four principles: perceivable, operable, understandable, and robust, which structure the accessibility guidelines. For each guideline, several success criteria guide evaluators to check the success criteria.

Accessibility checking tools are software programs or online services that check content against WCAG 2 techniques. Various WCAG techniques exist that guide developers and evaluators on how to meet the success criteria.

The evaluation was carried out in December 2025, on a sample that includes the last 100 municipal websites by the number of inhabitants. The total population of these towns is 531.8 thousand (min=1.4, max=7.6), representing 5.4 % of Romania's urban population and 2.8% from the total.

For each website, the home page was checked against WCAG2 A by using two accessibility checking tools: Total Validator [30] and Wave [31].

Total Validator is an accessibility evaluation tool that is offered in four versions: Test, Basic, Professional, and Embedded, under Windows, MacOS, and Linux. Depending on the chosen package, it can also make a linguistic analysis, providing support for five languages. The reports include HTML, CSS, and WCAG errors, with a link to the information on the validation reference.

Wave - Web Accessibility Assessment Tool is a free tool that enables testing a site locally through a Chrome extension, giving the results in a two-pane view: left for a summary and details on errors, and right for the content with error and warning icons.

Wave uses a color-coding system: red, green, and yellow, indicating errors to be corrected, respectively, for the lines that are correct but need to be checked, and for potential issues.

For each tool, accessibility errors have been analyzed and discussed in relation to the accessibility principles and guidelines.

4. EVALUATION RESULTS

4.1 Summary of results

A summary of evaluation results showing the number of websites based on the total number of errors is presented in Table 1. There are only four, respectively six, error-free websites, which means that over 90% do not pass the lowest WCAG 2 level of compliance.

Table 1. Websites by the number of WCAG 2 errors

Errors range	Total Validator	Wave
none	4	6
1-10	15	47
11-20	27	24
21-50	31	15
51-100	10	7
>100	13	1
Total	100	100

The accessibility check with Total Validator reveals that most websites have between 11 and 50 WCAG 2 errors (58%). In the case of using Wave, most websites have between 1 and 20 WCAG 2 errors (71%). In both cases, most of the websites are in the range of 1 to 50 errors, which accounts for 73% respectively 86% from the sample.

A summary of errors with a maximum of 742 detected by Total Validator, respectively 121 detected by Wave, is presented in Table 2.

Table 2. Number of WCAG 2 errors

Categories	Errors	M	SD
Total Validator	4768	47.68	88.14
Wave	1730	17.30	21.28

Averaging data obtained with both tools results in a total of 3249 (SD=2148).

4.2 Results using Total Validator

The accessibility evaluation using Total Validator resulted in 4768 errors (M=47.68, SD=88.14). Most frequent accessibility issues are presented in Table 3.

Table 3. Errors detected by Total Validator

Guideline	Websites	Errors	%
alternative text	57	683	14.32
labels	73	333	6.98
headings	75	268	5.62
link description	93	1361	28.54
unique IDs	25	1644	34.48
tags intead CSS	30	289	6.06
Other		190	3.98
Total	96	4768	100.00

Lack of link description was detected in 93 websites, duplicate IDs in 25 websites, and lack of a text alternative for non-text content (usually images) was

detected in 57 websites. Together, these three level A violations account for 77.35% of the total number of errors.

According to WCAG2, identifiers should be unique in a document to allow a consistent interpretation of webpages. Duplicate IDs refer to this violation and account for 34.48% from the total number of errors.

For each link, a description should be provided that reveals the purpose of using it and makes it possible to distinguish between different links. Another error related to link description is using the same text description for different links. These two errors account for 28.54% from the total. These are also the most widespread in the sample, found on 93 websites.

An important issue is the lack of alternative text for non-text content. If not provided, it is not possible for assistive technologies like screen readers to convey the purpose of the respective content to the user. This error accounts for 14.32% from the total. The fact that it was found on only 57 websites suggests that most developers are aware of it.

Another WCAG recommendation is associate a label with a form control in a proper way so it can be read by assistive technologies. If not, users may not be able to identify the purpose of the control. This error accounts for 6.98% from the total number of errors.

According to WCAG2, tags that are used to create a presentation effect should not be used. For this purpose, CSS (Control Style Sheets) should be used. Using tags instead of CSS accounts for 6.06 from the total number of errors.

Another error that was found in 75 websites is the improper use of headings by improperly ordering or skipping levels. Many users are using headings to navigate, so giving a meaningful name is also important. This error accounts for 5.62% from the total.

4.3 Results using Wave

The accessibility check with Wave resulted in 1,730 errors (M=17.30, SD=21.28). Most frequent accessibility issues are presented in Table 4.

Lack of link description was detected in 64 websites, and lack of a text alternative for an image was detected in 66 websites. Together, these two level A violations account for 79.02% of the total number of errors.

Lack of labels or improper labeling of form controls and improper use of headings are other frequent errors that together account for 13.94% from the total number of errors.

Table 4. Errors detected by Wave

Guideline	No.	Err	%
alternative text	66	773	44.68
labels	52	166	9.60
headings	14	75	4.34
link description	64	596	34.45
unique IDs	4	31	1.79
tags instead CSS	6	37	2.14
Other A errors		52	3.01
TOTAL	94	1730	100.00

4.4 Comparison with previous data

A comparison of the number of WCAG 2.0 errors detected by each tool on the first 100 municipal websites [3] is presented in Table 5.

Table 5. Comparison between samples

Guideline	Small towns		Big towns	
	TV	Wave	TV	Wave
alternative text	683	773	914	502
labels	333	166	333	209
headings	268	75	773	38
link description	1361	596	1894	1910
duplicate IDs	1644	31	299	5
tags intead CSS	289	37	1501	16
Other	190	52	188	124
Total	4768	1730	5902	2804

Overall, the evaluation with both tools shows that the websites of small municipalities have fewer accessibility errors, with a difference of 1134 for Total Validator and 1074 for Wave.

4.5 Comparison between tools

There are many differences in the number of errors detected by each tool. Total Validator detected 4768 violations of level A compliance, significantly more than Wave (1730). Table 6 presents a comparison by accessibility principle.

Table 6. Comparison between errors detected by each tool

Accessibility principle	Total Validator	Wave
perceivable	1573	1051
operable	1470	601
understandable	53	5
robust	1672	73
Total	4768	1730

The highest differences are related to the fourth accessibility principle (robust), more specifically, to the lack of unique IDs in a document.

Many differences are related to the techniques used by each tool to check a success criterion and the way errors are reported. Total Validator associates each

error with a guideline and a technique, so several errors could refer to the same accessibility guideline. Wave reports the user interface elements that do not comply with a guideline by placing a colored icon on them. It does not mention the technique used, but mentions all guidelines that may be violated.

4.6 Discussion

This study confirms that the accessibility of Romanian municipal websites is low. The most frequent accessibility errors are the lack of a text description for a link, the lack of a text alternative for non-text content, the lack of labels for controls, and improper ordering of headings.

As regards the accessibility checking tools, both this study and the previous one show large differences between the results provided by Total Validator and Wave, confirming that relying on only one tool is not enough [13], [[32].

Last but not least, although accessibility errors reveal problems that users with visual impairment using a screen reader may have, several accessibility issues affect all users. The alternative text for an image that a sighted user sees on mouse over lets them know, for example, which building is in a photo. Another example is the text description that appears on a link on mouse over, which helps navigation.

As mentioned in other studies, several factors exist that contribute to a low level of accessibility: little awareness of web accessibility, the lack of regulations, limited budget, and poor quality management [14], [33].

A recent document of the European Commission is the review of the WAD application [2] that mentions, as conclusions and lessons learned, the following issues:

- Shortage of accessibility expertise that may be compensated for by training people with disabilities to become digital accessibility experts.
- Poor awareness and usage among end-users.
- Reduced comparability of the monitoring results.

This study has inherent limitations of automated accessibility checking [12] and the evaluation of only the homepage. A third limitation is the evaluation of only the lowest accessibility level.

5. CONCLUSION

The accessibility of Romanian municipal websites is low. There are very few error-free websites and many WCAG 2 violations, which prevent fair access to information for visually impaired people.

Meeting the demands of the European Accessibility requires a clear accessibility policy on web services procurement, increasing awareness among end-users, strengthening the web accessibility task force, and systematic monitoring of the accessibility status.

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