REVIEW

of the participation materials required in applying for an academic position "**Professor**" in department **„Forest management ang Management "**, field of higher education **5. Technical science**, professional direction **5.7. Architecture, Civil Engineering and Geodesy,** scientific specialty „**Photogrammetry and Remote Sensing**", with discipline **„Photogrammetry and Remote Sensing"**, announced by the University of Forestry in National Newspaper issue 102/08.12.2024, procedure code **FOR-P-1123-111**.

Application candidate:

Assoc. Prof. PhD Mariya Tsankova Asenova.

Reviewer: PhD Vasil Georgiev Valchinov, Prof. in General, Higher and Applied Geodesy (Geodesy and Geoinformatics), professional direction **5.7. University of Architecture, Civil Engineering and Geodesy, UACEG, pensioner.**

The review has been conducted based on the decision of Scientific jury of the procedure with code FOR-P-1123-111 from its first proceedings on 14.02.2024 and it reflects the educational, scientific and research implementation of Mariya Asenova after acquiring the academic position of Associate Professor in 2017.

1. Short candidate biography

The candidate Assoc. Prof. PhD Mariya Asenova completes her secondary education majoring in mathematics in 1980. She finishes her higher education in 1987 graduating from HIAC's Faculty of Geodesy in Sofia (now University of Architecture, Civil Engineering and Geodesy). She holds a masters degree in Geodesy, Photogrammetry and Cartography.

She has been a part of the University of Forestry (UF) since 1987 in the following capacity:

- 2 years as an engineering researcher;
- 4 years as assistant professor;
- 4 years as senior assistant;
- 10 years as chief assistant.

In the period of 2012-2014 she is a self-funded PhD student and successfully defends her doctorate in "Optimization of database structures (DB) and spacial analysis of specialized geographic information systems (GIS) in forest applications" thus acquiring an Educational and Scientific PhD. In 2017 she acquires an Associate Professor position in the department of Forest Management (now Forest Management and Management). Since July of 2022 she is serving as Head of the aforementioned department.

From 2017 until now has been giving lectures and running exercises and learning practices. She is credited as an expert and supervisor in over 60 scientific, applied-science and implementation practices in the field of photogrammetry, remote sensing and GIS in various different areas of forestry.

Since starting her work at UF she has gone through a series of increments of her professional qualifications in information technologies and web technologies while working with GIS Mapinfo Professional, InterChange program, usage of SAR data in various scientific areas. She is fluent in Russian and English.

Assoc. Prof. Mariya Asenova possesses professional competency and design capacity, licensed to practice within the Law for Cadastre and Property Registry, Law on Restitution of Agricultural Land Ownership, Law on Restoration of Ownership of Forests and Lands from the Forest Fund, issued by the relevant state institution. She is a member of professional and scientific organizations such as the Union of Surveyors and Land Planners in Bulgaria, Bulgarian Cartographic Association, Bulgarian Geographical Society. She is also on the editorial board of the "Geodesy, Cartography,

Land Management" magazine, management board member of the Union of Surveyors and Land Planners in Bulgaria and more.

2. **Compliance of the candidate's submitted documents and materials according to the Regulations for Development of the Academic Staff at UF**

Assoc. Prof. **Mariya Asenova** presents 3 folders of documents with the application:

Folder 1 containing documents required by the Law of the Development of the Academic Staff in Bulgaria and in accordance with Art. 65 and 65a of the Regulations for Development of the Academic Staff at UF. This folder also includes documents for other activities of the applicant with certificates and supporting documents from the relevant institutions;

Folder 2 contains a list of post-doctoral publications, copies of publications and place of publication;

Folder 3 has copies of books, textbooks, manuals, monograph, joint monograph chapter and related reviews, protocols and other surrounding documents.

All materials and documents related to the application are perfectly organized and provide a complete overview of the educational, pedagogical, scientific, research and design activities of the candidate.

Considering minimum national requirement of 600 point for acquiring the academic position "professor" according to indicators A, V, G, D, E it can be observed that the scientific research and publication compliance report of Assoc. Prof. Mariya Asenova has accumulated a collective 1104 points, meeting the minimum requirement of each indicator. Furthermore, for indicator G the candidate has over three times the required points.

This indicator is formed by considering any articles and reports issued in scientific publications, referenced and indexed in world-renowned scientific databases, articles and reports published in non-referenced journals or published in collective edited volumes and a published chapter of a collective monograph.

In total, according to item 2 of the review, I determine that the documentation is complete, in order and perfectly put together. It meets the normative requirements of the procedure for occupying the academic position of "professor" at UF in the discipline "Photogrammetry and Remote **Sensing**" in scientific field 5. Technical science, professional direction 5.7. Architecture, Civil Engineering and Geodesy.

3. Assessment of the candidate's educational and lecturing activities

From 2017 until now, the candidate has been conducting lectures, exercises and educational practices in a total of 3 faculties across 4 specialties in the following disciplines: "Photogrammetry and Remote Sensing ", "Geographic Information Systems (GIS)", "Remote Mapping **Sensing** ", "GIS and Remote Sensing", "Surveying", "Surveying and Vertical Planning" and "Specialized GIS Applications".

These disciplines are in different forms of education: full-time, part-time and are in different year courses (first to fifth) spread around varying educational levels, e.g. bachelor's and master's. This requires additional responsibilities for quality conduct of the educational process. From the attached official note in FOLDER 1 of the applicant's documents, it can be seen that Associate Professor Asenova has fulfilled the required standard for classroom occupancy after 2017, including for the winter semester of the 2023/2024 academic year.

She has served as the academic supervisor for 11 graduates, academic consultant to 6 graduates, and has reviewed 20 diploma theses in the field of "Forestry", Educational qualification "master's". Here I would add that she is the founder and leader of a GIS club at UF, a very good

form of extracurricular academic work with students. The club is quite successful and has received awards at both university and non-university levels.

An essential responsibility of a university lecturer, besides delivering lectures and exercises at a contemporary and level, is to ensure the success of the educational process for their disciplines with textbooks and teaching materials. In this regard, Associate Professor Asenova has contributed to collective efforts and also independently authored a total of 11 textbooks and teaching materials, 3 of which were published after 2017, as detailed in the candidate's materials. She has modernized educational documentation and developed new curricula for 5 disciplines during the 2021 academic year for the faculty of "Ecology and Landscape Architecture". As evidenced by this activity, the candidate's teaching and educational activities are well supported with educational and pedagogical literature—guides, teaching aids, and materials— all helping the quality conduct of the educational process.

Associate Prof. Mariya Asenova has excellent skills in working with modern geodetic, photogrammetric, and GPS equipment. She proficiently utilizes GIS software such as MapInfo, ArcGIS, ERDAS, and others, as well as widely used software domestically such as MKAD, AutoCAD, and other systems and software applications. In her teaching work, she employs distance learning platforms such as Blackboard Learn+, Blackboard, Teams, Zoom, which provide mobility for conducting educational processes.

As one of the requirements of the professorship procedure is scientific supervision of doctoral students, I'd like to mention that Associate Professor Asenova has supervised 1 doctoral student, who has withdrawn with the right to defend their thesis in 2022, and currently she is serving as an academic consultant to 1 doctoral student, enrolled in 2023. In conclusion, I confidently give a positive evaluation of the candidate in this position based on the aforementioned.

4. **Evaluation of the candidate's scientific, applied-science and publication activities**

The scientific, applied-science, and publication activities of Associate Prof. Mariya Asenova are in the following areas: Photogrammetry and remote sensing with applications in forestry, Implementation of GIS for forests, Use of GIS in other forestry related areas, and GIS application training of personnel. This is a broad and diverse spectrum of activities in which the candidate has achieved significant results.

4.1 Participation in scientific, applied-science, and educational projects

After obtaining her associate professorship, the candidate participated in a total of 10 projects as an expert and leader, which all fall into the following categories:

- International scientific or educational project – 1 project as an expert;
- National scientific or educational projects – 8 projects as an expert;
- Leadership of a national scientific or educational project – 1 project.

The projects were co-funded by the European Union – 1 project, funded by the Science Research Sector of UF – 2 projects, by the "Scientific Research" fund of the Ministry of Education and Science – 1 project, state budget funded – 5 projects, through the European program "Horizon 2020" - 1 project. Descriptions of the positions held in the projects and their duration are provided in the Participation Report in project Folder 1.

4.2. Characterization of the published scientific results

The total number of Assoc. Prof. Mariya Asenova's publications towards educational and scientific degrees are 4 for "doctor", 37 for "associate professor", and 39 for "professor".

Only publications for the "professor" qualification are peer-reviewed. They are distributed according to the following indicators:

- V3: Monograph – 1 copy.
- G6: Published book based on defended dissertation work – 1 copy

- G7: Articles and reports published in scientific journals, referenced and indexed in globally recognized scientific databases – 15 items.
- G8: Articles and reports published in non-peer-reviewed journals following scientific review or published in edited collective volumes – 18 items.
- G9: Published chapter in a collective monograph – 1 copy.
- E23: Published university textbook – 1 copy.
- E24: Published university teaching aids – 2 copies of which 1 is a co-authored;
- In terms of publication locations, they are: in Bulgaria – 39 items; abroad – 0 items.
- Language in which they are published: in Bulgarian – 25 pieces; in English – 14. Breakdown by number of authors:
  - Independently authored – 16 items;
  - Single co-author – 12 items;
  - Two co-authors – 8 items;
  - Two or more co-authors – 3 items;
- In terms of authorship, Assoc. Asenova is the first author of 33 publications; second co-author of 4 publications, and third co-author of 2 publications.

All presented publications in the competition are peer-reviewed and printed in Bulgarian approved and referenced journals or in editions of international scientific forums. Their publication is confirmed by certificates provided by the candidate. The monograph, the collective monograph part, the published textbooks, and manuals have reviews attached to the documents in Folder 3.

The analysis of the candidate's submitted publications demonstrates a deep and consistent scientific effort. Following her selection as an associate professor, the candidate has prepared and published 39 items, averaging 6.5 publications per year since 2017, which according to the reviewer, are very good credentials. This is particularly impressive considering that she is a university lecturer, preparing lectures, exercise assignments, supervising undergraduate and graduate students, and heading the Department of Forestry and Management. The reviewer's opinion of the candidate's published materials for her scientific work is very high due to the large volumes and intensity of publications covering a wide range of the candidate's scientific interests. It is evident that a large number of the publications are part of the proceedings of international forums – 10 items, of international scientific forums following scientific review – 9 items, totaling 19 items.

4.3. Summary of the candidate's scientific activity cited in various literature

Candidate Assoc. Prof. Mariya Asenova presents her publications which have been cited by the following groups:

- Citations or reviews in scientific publications, referenced and indexed in globally recognized scientific databases or in monographs and collective volumes – 10 items.

The citations in this group are in publications written by authors from Bulgaria – 4 items, China – 2 items, Brazil – 1 item, Italy – 1 item, USA – 1 item, Brazil – 1 piece; The foreign citations are in publications in scientific journals with high-impact factor – 6 items, indexed in Scopus – 2 items, indexed in Web of Science – 2 items.

- Citations of the candidate's publications in monographs and collective volumes following scientific review – 7 items. They are used by Bulgarian scholars in 2 books and included in publications presented at international scientific forums;
- Citations of the candidate's publications in non-peer-reviewed journals following scientific review – 24 items.

They are used by Bulgarian scholars – 18 items and by foreign scholars – 6 items (from Indonesia – 2 items, USA – 1 item, Greece – 1 item, and Ukraine – 2 items). It should be noted that 11 of

the citations in Bulgaria are used in dissertations for "doctor" degree qualification, which confirms that the candidate is well known to the teachers and researchers working on issues in the subject of "forestry management".

At this point it is necessary to draw the conclusion that the large number of citations, 41 in total, for 32 publications of the candidate is evidence of Assoc. Asenova's significant achievements in her scientific career. She is a well-known educator and researcher in her professional and scientific field not only domestically but also abroad (a total of 10 citations). It's important to note that she has been cited by publications before her appointment as an associate professor, which proves consistency and further development of her scientific potential.

4.4. Contributions of the candidate's work (scientific, applied-science, applied)

The candidate's contributions are presented in two groups: for publications according to indicator V3: Monograph and overall for publications according to indicators G7: Articles and reports published in scientific journals, referenced and indexed in globally recognized scientific databases, G8: Articles and reports published in non-referenced journals following scientific review or published in edited collective volumes, and according to indicator G9: Published chapter in a collective monograph.

4.4.1 Contributions in the monograph "Geoinformatic Approaches and Solutions in GIS Application for Forest Territories," Sofia, 2023, Intel Entrance, ISBN 978-619-7703-45-0.

The monograph synthesizes the candidate's years of experience in applying photogrammetric and remote sensing , creating spatial databases for forests, implementing GIS in forestry, and using them for forest territory monitoring for traditional and specific purposes. Contributions can be categorized into two groups: applied-science and applied.

1. Applied-science contributions

1.1. In theoretical and practical aspects, the monograph serves as a methodology, an instruction for creating spatial data for forests in Bulgaria using ground-based, photogrammetric and remote sensing , including navigational, unmanned and aerial scanning systems using geographic information systems (GIS).

1.2. Technologies with GIS have been developed and used in experimented for the purposes of joint application of spatial data by specialized databases applying to forests management, control, and exploitation of forest territories at all administrative levels.

1.3. The geo-informational status and priorities in the forestry sector over the past 25 years have been synthesized in accordance with the national and European framework up until 2030. This is done for the purposes of creating a unified GIS for the needs of forestry, maximizing the use of existing databases from national and international geoportals and platforms (Table 1.1), and creating new data through ground-based, photogrammetric, and remote sensing, including navigation, unmanned and scanning technologies, and the synchronization between them.

1.4. The necessity of appropriately structured databases for automated spatial analysis using GIS with a view of receiving regulated applications as well as consumer tasks.

1.5. The main tasks in providing informational security of forest structures have been defined, as well as the qualities that a specialized national forest GIS should possess – handling large databases, speed, efficiency, expert systems, artificial intelligence. The advantages of GIS in a unified technological environment are summarized in order to store and use vector, raster, and attribute data from various sources of the forest territorial units and to achieve automation of the preparation of specialized plans, maps, reports, balances, statistics, and decision-making.

1.6. Definitions for the most essential applications of a GIS database for control, organization, management, and exploitation of forest management territories managed by forestry enterprises have been outlined in section 3.1.

1.7. Contribution of the monograph is the technology for applications of aerial, satellite, Lidar images, and GNSS in a GIS environment used for fundamental activities in forests. Each one of the activities listed below is compatible with creation of databases from existing and new sources, technology for integration and processing using GIS, and acquiring of results. They are compared with reference data, their accuracy is evaluated, and the applicability of technological solutions for:

- Mapping and inventory of forest territories (section 3.2);
- Planning and management of forest territories through GIS (section 3.3);
- Implementation of forest management plans (section 3.4);
- Conservation and control of forest territories (section 3.5);
- Investigation of the state of forest plantations (section 3.6);
- Risk mapping of forest fires (section 3.7).

2. Applied contributions

2.1. Application of orthographic images for mapping and inventory of forests in UOGS "Petrohan", Barzia, Berkovitsa municipality;

2.2. Application of GIS in decoding and determination of forest taxation indicators in UOGS "G. Avramov", Yundola, Velingrad municipality, and the analysis of the obtained results;

2.3. Photogrammetric determination of forest plantation taxation indicators in national forestry"Sliven" and analysis of the results obtained;

2.4. Usage of GIS for automated classification of spectrophotometric images of objects in national park “Central Balkan” and Rila National Park taken from satellite data and images from unmanned aerial systems;

2.5. Thematic maps, part of the plans for multi-functional management of national forestry "Rakitovo", Pazardzhik region, and DGS "Berkovitsa";

2.6. Thematic maps for UOGS "Petrohan" and UOGS "G. Avramov", Yundola, for planning and management of forest territories, developed with GIS;

2.7. Hunting management maps by regions, hunting grounds, and hunting management events. Wildlife habitat assessment at the departmental level in a GIS environment;

2.8. Fire hazard study for partial territories of DGS "Stara Zagora" and creation of interactive maps for road and hydro-graphic networks, firefighting activities and other elements using Google Earth Pro;

2.9. Automated compilation of specialized references necessary for the preparation of forest management report forms of national forestry "Targovishte";

2.10. GIS solution for managing protected areas and territories in educational experimental forestry "G. Avramov";

2.11. Appropriately illustrated GIS applications related to the implementation of forest management plans, provided in section 3.4;

2.12. Computer analysis and control of the implementation of forest management activities in the Southeastern national forest enterprise "Sliven" through mobile GIS applications (section 3.5);

2.13. Condition study of forest plantations in section 3.6 using images from unmanned aerial vehicles in a GIS environment. Mapping and assessment of the type and extent of damage to affected areas;

2.14. Particularly valuable developments done in section 3.7 are for mapping forest fire risks and determining the risk of forest fires for the regions in Bulgaria, using MapInfo, Google Earth Pro, and QGIS, as well as the crafted thematic maps displaying the risk degree of fires.

4.4.2. Contributions to articles and reports, published in scientific journals, referenced and indexed in world-renowned scientific databases, articles and reports published in non-peer-reviewed journals following scientific review or published in edited collective volumes, and a published chapter in a collective monograph.

The total number of publications under this indicator is 34. The candidate has identified 19 contributions. Contributions are classified according to the main direction of the candidate's scientific, applied-science, and publishing activities:

1. Photogrammetry and remote sensing applicable to forestry management

• In this group, the candidate has scientific, applied-science, and applied contributions towards automation of tree canopie mapping utilizing data from unmanned aerial systems during research of mature forests (G7.11), forest inventory management through personal laser scanning in order to obtain numerical taxation parameters of forest plantations (G7.12, G8.8), applications of remote sensing sensing and GIS usage for determining structural data of forests maturing phases through orthographic, satellite, and field data (G7.7, G9.1); assessment of forest plantation conditions using digital images from unmanned aerial systems and satellite data (G7.2, G7.8, G7.9, G7.10, G8.1), evaluation and mapping of forest fire risk (G7.1), fully developed system forest fire risk forecasting (G.8.12).

• From the efforts made in this group, I identify as ***scientific*** contributions 2 and 8, ***applied-science*** – contributions 1, 5, 6, 7, 9, and ***applied*** – contributions 3, 4 referenced from the candidate's contribution summary.

2. Implementation of Geographic Information Systems (GIS) for forest application

In this group, the candidate has applied-science and applied contributions in the following areas:

- Application of GIS for creating reports with statistical purposes in forestry (G8.9).
- Establishing an infrastructure for spatial data of the forest territories of Bulgaria (G7.14).
- Implementation monitoring of forestry activities through mobile GIS applications (G8.3).
- Integration of data from freely accessible GIS platforms in forest management and control (G8.12).
- Analysis of forest road networks and transport development in forest areas (G7.15);
- Design of specialized GIS databases used in forest fire protection (G8.6).
- Study of natural disturbances and disasters in forest areas using unmanned aerial systems (G8.15, G8.18).
- Investigation of the state of protective forest belts in Bulgaria (G8.13).

In this group, ***applied-science*** contributions are 10, 14, and ***applied*** contributions are 11, 12, 13, 15, 16.

3. Utilization of GIS in other forest-related areas

In this third group, the applied-science and applied areas include: mapping of plant community sites and conservation significant species through GIS (G7.3), GIS based approach for database update of century-old trees in Sofia (G7.6), designing spatial databases for urban tree vegetation (G8.2), proposed methodological approach for selecting territorial units and conducting field measurements to study the "soil – soil microorganisms – tree composition" system (G7.13), establishment of specialized GIS databases for logistics, alternative tourism, and the furniture industry in Bulgaria (G8.4, G7.5, G7.4, G8.14).

Efforts in this group classified as ***applied-science*** contributions are 17, 18, and 19.

4. **Training of personnel in photogrammetry, remote sensing, and GIS**

For a university lecturer, personnel training at a high level is particularly important as well as encouragement of technological and algorithmic thinking. The reviewer in this part of the review finds the activity of Assoc. Prof. Mariya Asenova particularly positive in her publications on

training in Photogrammetry and Remote Sensing at the University of Forestry (G8.17, E23.1), challenges in GIS training during a global health crisis (G8.16, E24.1), and training in Geodesy (E24.2).

5. Assessment of the candidate's personal contribution

As seen from the general description of presented materials presented in section 2 of the review, out of the candidate's 39 publications, in 16 she is credited as the sole author, while 12 have one co-author. The rest have more than one co-author. This indicates that the majority of the candidate's scientific output is her own work. At the same time, collaborative projects, as well as contributions to collective monographs, textbooks, and manuals, confirm the candidate's ability to work well in a team, which is important for a university lecturer. The publications in English show scientific recognition for Assoc. Prof. Mariya Asenova's both domestically as well as abroad. I accept that the sole-authored publications are the candidate's own work, and in the cases of collaborative publications, the contribution of all authors is equal unless specified otherwise.

6. Critical notes and recommendations

To Assoc. Prof. Asenova I recommend the following:

1. To concentrate her scientific efforts on fewer areas, for example, in creating databases for researching and maintaining forest road infrastructure, which relates to forest maintenance, exploitation, accessibility during fires, ecosystem maintenance, etc.;

2. To assess the sufficiency of the current regulatory framework and propose a new one, aiming to establish a national database for management of forest territories.

7. Personal impression

I have direct observation of the professional and scientific development of Assoc. Prof. Mariya Asenova. She is a very responsible and thorough lecturer and researcher. She applies the latest advancements in geoinformation technologies in both her teaching process and her scientific research. She has solid knowledge of databases, GIS, and is aware of the subject area specifics she applies them to. This is fully confirmed by the presented scientific output in the professorship application process. She has successfully completed scientific and implementation projects in which she participates or manages by applying great persistence and professional potential,
She manages to transfer the accumulated experience from scientific developments and projects into the teaching process, which is a testament to her teaching work. The candidate Assoc. Prof. Mariya Asenova is well known in the geodetic community at UF, among students and teachers alike. She maintains a good number of professional relationships and provides endless knowledge and experience acquired from applied-science developments, projects, and practice in the field of forestry.

8. Conclusion

In connection with the points made in the review, I recommend that Assoc. Prof. PhD Mariya Tsankova Asenova be appointed the academic position of **"Professor"** in the discipline of **"Photogrammetry and Remote Sensing"** within professional direction **5.7. Architecture, Civil Engineering, and Geodesy, scientific specialty "Photogrammetry and Remote Sensing ".**

Reviewer's signature:

Submission date: 9.04.2024