PHOTOGENIC

D1.2

Project Quality and Risk Assessment Plan

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Abstract:	The project quality plan shows the project management process, review process, quality checks, meeting organization, which is communicated to all partners. The risk assessment plan shows how potential risks are assessed and mitigated in order to avoid any negative influence on the PhotoGeNIC project objectives.
Keywords:	Quality planning, quality assurance, quality control, visual identity, project policy, risk assessment

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Disclaimer

Executive Summary

The Project Quality Plan shows how quality aspects are taken into account in a variety of processes and activities within the PhotoGeNIC project. The interrelated quality processes – planning, assurance and control – have impact on the project work from its start to its end.

- Quality Planning refers to quality policies like meeting, deliverable or publication policies, the definition of responsibilities as well as the creation of a corporate visual identity including a project logo, project-like designed templates etc. In order to communicate adequately within the project as well as to project external persons, several tools, such as project policies including meetings, deliverables and the publication process of scientific papers, are established and explained in this document.
- Quality Assurance involves the establishment of Interim Management Reports, clear responsibilities and regular, clearly guided telephone conferences. A well-defined internal review process further supports the quality assurance of deliverables.
- Quality Control focuses on feedback through internal processes (internal review process) as well as external advices (Advisory Board). It further monitors how feedback is implemented and assures the project outcomes through proactive risk management.

The plan is effective throughout the lifetime of the project but is open to revision if necessary. Responsibilities for quality planning, assurance and control are shared between all partners, which allow various views on quality issues in order to reach the optimal outcome.

The PhotoGeNIC Risk Assessment Plan describes how potential risks are assessed, managed and predicted, how their impact is estimated and how mitigation measures are defined within the project. It outlines management components and the applied approach and tools that help to avoid any negative influence on the PhotoGeNIC project objectives.

In order to be aware of the central project activities in relation to the project timeline, the critical path of PhotoGeNIC was defined. Within the project, the iterative and interrelated steps of risk identification, risk analysis & monitoring, as well as risk treatment, are accompanied by easy-to-use tools, clear responsibilities and efficient communication channels towards effective risk management. Since the PhotoGeNIC consortium is aware of the swift changing environment it is contributing to, risks are regularly monitored, mitigation plans updated and actions taken whenever necessary.

This document outlines the risk management process established within Task 1.2 of the PhotoGeNIC project, based on scientific theoretical background. Detailed risk assessment on work package level is performed on a regular basis.

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Chapter 1 Introduction

The Project Quality Plan is an integral part of the PhotoGeNIC project management. Its purpose is to describe how quality will be managed throughout the lifecycle of the project. Quality must always be planned in a project in order to prevent unnecessary rework, as well as waste of cost and time. Quality should also be considered from both, an outcome and process perspective. The processes and activities that produce deliverables need to fulfil certain quality levels in order to reach the expected high-quality outcome. To address all quality requirements and quality assurance mechanisms in the PhotoGeNIC project, the 'Project Quality Plan' at hand has been developed by the project team. This plan acts as the quality handbook for the project and all partners will adhere to the project quality plan.

Each project has its characteristics in terms of partners, work packages (WPs) etc. and therefore requires an individual quality plan, clear responsibilities, and contact persons. This and how to get on board of the PhotoGeNIC project is described within Chapter 2.

The overall **Quality Management Strategy** of PhotoGeNIC is addressed in Chapter 3. It is divided into three key activities:

- **Quality Planning**

Quality Planning comprises quality policies and procedures relevant to the project for both project deliverables and project processes, defines who is responsible for what, and documents compliance with EC regulations. A corporate visual identity represents the project internally, in partners' organisations as well as externally. In order to communicate adequately within the project as well as to project external persons, several tools are established and introduced in this chapter. Clearly defined project policies in terms of policies for deliverable naming, for meetings, for scientific publications or the procedure of internal deliverable review etc. give security to the project partners, as they have clear guidance how to deal with upcoming issues.

- **Quality Assurance**

Quality Assurance creates and monitors project processes, which need to be performed effectively to reach the targeted outcome. This involves the establishment of Interim Management Reports, clear responsibilities, and regular, clearly guided telephone conferences (conf calls) and face-to-face meetings. These activities within PhotoGeNIC are summarized in section 3.2.

- **Quality Control**

Quality Control will be actively performed by all partners, e.g., by acting as an internal reviewer of deliverables. A clear internal review process has been defined before Deliverable Submission to provide feedback to the editor. Proactive risk management has already been mentioned within the Description of Action (DoA). Risk management has been established as planned in order to guarantee the project quality and avoid delays or failures. Feedback on the project progress and outcomes by the Advisory Board will support the quality controlling and guide the project into the right direction. This is described in section 3.3.

Furthermore, the PhotoGeNIC consortium has established an effective **Risk Management Strategy** that allows dealing with challenges throughout the project and successfully achieving the planned project objectives or even going beyond. Failing to follow a structured project risk management process could quickly lead to project failure. Therefore, within PhotoGeNIC a clearly structured process of risk identification, risk analysis & monitoring and risk treatment has been established (see Chapter 4). This process already started with the risk identification during the proposal preparation phase, continued in all process steps within the first year of the project and will accompany PhotoGeNIC throughout the project's lifetime. In order to emphasize this process, communication as well as easy risk assessment tools turned out to be critical factors. Chapter 5 displays the practical

risk assessment of the project including an evaluation of probability and severity as well as mitigation plans for all pre-defined risks as well as summarizes the way risk management is performed within PhotoGeNIC and how this process is going to be continued in the future.

The target of the following chapters is to describe how all the mentioned pieces of the puzzle fit and stick together.

Chapter 2 Project Structure

This chapter gives an introduction to the project characteristics in order to allow new members to get easier on board and find important information at a glance. Therefore, this chapter will introduce shortly the main elements of the PhotoGeNIC project in terms of participants, WPs and responsibilities.

2.1 Project Bodies

PhotoGeNIC is a research project with six Work Packages (WPs) and 8 partners, coordinated by TEC. VIGO supports the Coordinator and acts as the technical leader.

1) **TEC** – TECHNIKON Forschungs- und Planungsgesellschaft mbH, Austria (AT)
2) **VIGO** – VIGO Photonics, Poland (PL)
3) **TUL** – Politechnika Łódzka, Poland (PL)
4) **PMD** – pmdindustrial GmbH, Germany (DE)
5) **CNRS-LAAS** – Centre National De La Recherche Scientifique CNRS, France (FR)
6) **UMICORE** – UMICORE, Belgium (BE)
7) **XENO** – XenomatiX, Belgium (BE)
8) **IMiF** – Łukasiewicz-IMIF, Poland (PL)

The interaction, responsibilities and decision-making power is clearly divided between the established project bodies. The governing culture of the PhotoGeNIC project is based on democracy, co-determination and clear leadership.

The defined PhotoGeNIC project bodies, the decision-making processes, as well as the responsibilities are bindingly described in the Consortium Agreement and in the Grant Agreement.

The **Project Management** consists of the Coordinator Technikon (main representative: Patrick Leczek), and the Technical Leader VIGO (main representative: Włodzimierz Strupiński).

The **General Assembly** (GA) is the assembly of all partners and therefore the decision-making body of the consortium. Therefore, it is the highest authority in PhotoGeNIC. It was established within the proposal and therefore included in the Consortium Agreement (see CA section 6). The General Assembly is chaired by the Coordinator (TEC) unless otherwise agreed.

The **Executive Board** (EB) is the assembly of all work package leaders. It is chaired by the Technical Leader VIGO. According to the Consortium Agreement the Executive Board acts as the supervisory body for the execution of the project which shall report to and be accountable to the General Assembly. The Executive Board shall monitor the effective and efficient implementation of the project.

2.2 Steps Towards Participation

1) Initial registration

New participants in the project need to contact the coordinator in order to receive access to the PhotoGeNIC file sharing and editing platform.

2) Contacts and mailing lists

All contact details are added to the PhotoGeNIC contact list and the new participant will be subscribed to relevant mailing lists, as these are essential tools for project internal communication.

3) Project Handbook

New participants will receive the Project Handbook (via the PhotoGeNIC file sharing and editing platform) to get familiar with:

- the PhotoGeNIC infrastructure (file sharing and editing platform, public website)
- the project structure (partners, hierarchy of bodies, most important documents at a glance)
- the project procedures (meetings, deliverables, publications)

The project handbook is designed in a way to be easily consulted and to provide quick answers to project newcomers. It is available as a PDF file on the PhotoGeNIC file sharing and editing platform and should be a living document. This implies that it will be updated regularly to record and list the lessons learned in order to improve the quality of the project. All partners will be involved in the revision process and informed about any updates. In general, TEC will be the main responsible partner for updating the project handbook. Updates will be performed whenever necessary, e.g. if there are changes to the mailing lists or if the project structure or the General Assembly / Executive Board composition changes. In any case, partners are always invited to propose updates if required.

4) Introduction and start

Once familiar with the project policies and the infrastructure, newcomers will find the most relevant documents like the Description of Action (DoA), Grant Agreement (GA) and Consortium Agreement (CA) on our file sharing and editing platform.

Chapter 3 Quality Management Strategy

Quality is the degree to which the project results fulfil the project requirements. For this purpose, a Quality Management Strategy has been defined within the PhotoGeNIC project through three key processes, namely Quality Planning, Quality Assurance and Quality Control. These three processes are interconnected and interact in order to guarantee efficient and high-quality work.

3.1 Quality Planning

Quality Planning determines quality policies and procedures relevant to the project for both project deliverables and project processes, defines who is responsible for what, and documents compliance with defined guidelines.

3.1.1 Visual Identity

The creation of a corporate visual identity plays a significant role in the way the PhotoGeNIC project presents itself to both internal and external stakeholders. A corporate visual identity expresses the values and ambitions of the project and its characteristics and makes the project visible and recognisable. It is of vital importance that people know that the project exists, remember its name as well as the names of its collaborators. In the following, we briefly list the actions that were taken in order to create a visual identity of the project. A more detailed presentation of the materials and activities can be found in D6.1 “Plan for dissemination and exploitation including communication activities”.

Logo: For the improvement of its visibility, the PhotoGeNIC project has adopted a project logo. The logo is used on all internal templates as well as on external dissemination tools.

Project website: For greater visibility of the project, a website was launched in the first months of the project. The PhotoGeNIC project website is available at the following link: https://horizon-photogenic.eu/

Leaflet: An informative and graphically appealing A5 leaflet, highlighting the PhotoGeNIC vision, main goals, as well as background information was created. It can be used for distribution at conferences or certain other events in order to provide further visibility to the PhotoGeNIC project. An electronic version of the leaflet is available on the PhotoGeNIC website.

Templates: Presenting the PhotoGeNIC project with a clear design is a claim by the whole consortium. Therefore, templates which bear the hallmark of the PhotoGeNIC design were created and made available to all project partners. All templates include the PhotoGeNIC logo, the project colours and a disclaimer and acknowledgement to the EC.

Social Media: In order to reach a broad target group, Twitter and LinkedIn are used to raise awareness of project specific news/results/publications and to foster cooperation activities.

3.1.2 Project Policies

Internal project guidelines, our so-called project policies, were established to organize internal and external processes in terms of meetings, deliverables, and publications, to ensure quality.

3.1.2.1 Meeting procedures

Since the outbreak of the Covid-19 pandemic in 2020, more physical meeting are planned to be taking place again within the PhotoGeNIC consortium, supported by a number of regular virtual meetings.

The consortium has decided that in general, the hosting partner of a meeting pays for conference facilities, catering etc., while each partner pays for travel, accommodation, and other provisions. Usually, the host invites for lunch and coffee breaks during the meeting. If possible, the hosting partner invites the partners to a common dinner. Meeting locations shall change regularly in order to achieve a fair distribution of costs. To keep costs down, we prefer to meet at company facilities that can often be used for free, rather than renting external facilities.

If that is not possible, the host can also arrange a conference room in a hotel or similar structure. Then the partners pay separately their conference fees (room fee including coffee and lunch breaks).

Meeting Room(s):

- On the first day we need one big room for approx. 15-20 people (if every partner shows up with 1-3 persons; a participant list will be created to provide further details).
- For the second day parallel sessions might be suitable. To plan such sessions, one or two rooms (for approx. 7-10 persons each) are required. (It will be decided in advanced how many breakout sessions are necessary for the dedicated meeting.)
- Are there any costs for the conference room/day/person? (e.g., coffee break or lunch)?
- Are there any other expenses?

Infrastructure/Equipment:

- Free WLAN at meeting/workshop
- Internet connection
- Projector/Beamer in each room
- Flip charts and pens
- Power outlets for all participants
- Optional: Microphone/Speaker for large rooms
- Possibility for hybrid meeting

The host of a PhotoGeNIC internal meeting has to prepare a 1-2 pager with logistic information approx. one month before the meeting. This 1-2 pager is checked by the Project Management Team and discussed within the technical progress conf calls to make sure that the meeting allocation fits the planned meeting and the number of participants.

The number of participants is collected through a participant list on the project SharePoint, which needs to be completed by all partners at least one and a half months before the meeting. The Coordinator together with the Technical Lead and the meeting host have to prepare an agenda approx. one month before the meeting.

All these specific requirements are already taken into account when choosing the host of the next meeting. If a partner volunteers to host a meeting but is not able to fulfil the meeting process described in section 3.1.2.1, another partner will be chosen for hosting it.

3.1.2.2 Deliverables

Deliverables must be stored in the “Deliverables” folder of the corresponding Work Package on GitLab. The following file naming is used for all deliverables:

- PhotoGeNIC-*[Dx.x]-[Level of Dissemination]-[Due-Month]*.

Nature of Deliverables

- "R" (Document, report)
- "DEM" (Demonstrator, pilot, prototype)
  Deliverables marked with nature "DEM" will be accompanied by a small written report outlining its structure and purpose in order to justify the achievement of the deliverable.
- "DMP" (Data management plan)
- "OTHER" (Other)
  Deliverables marked with nature "OTHER" will be accompanied by a small written report outlining its structure and purpose in order to justify the achievement of the deliverable.

As deliverables are the most important outcome of the project, excellent quality needs to be ensured. Therefore, an internal review process was defined, which is described in detail in section 3.3.1.

3.1.2.3 Publishing scientific papers and research data

Prior notice of any planned publication shall be given to the other parties **at least 30 days** before the planned publication submission date in accordance with the Consortium Agreement. Any objection to the planned publication shall be made in accordance with the CA in writing to the coordinator and to any party concerned within 15 days after receipt of the notice. If no objection is made within the time limit stated, the publication is permitted. (CA 8.4)

The project partners may agree in writing on different time limits to those set above, which may include a deadline for determining the appropriate steps to be taken.

Furthermore, the publication, or the link to it, will be made accessible on the project website**.** Partners shall inform the coordinator as soon as a link or document in pdf format is available. The Commission and any interested party will then be informed about the scientific publication via our website and social media channels.

In order to comply with GA Annex 5 (Article 17) the provision of open access to scientific publications, PhotoGeNIC publications will be uploaded on open access repositories (e.g., ArXiv, or set-ups from beneficiaries…).

All publications or any other dissemination relating to foreground generated with financial support from the European Commission shall include the following acknowledgment (GA 17.2 and 17.3):

Funded by the European Union

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3.2 Quality Assurance

The focus of quality assurance is on the creation and monitoring of processes. Quality assurance creates and monitors project processes, which need to be performed effectively to reach the targeted outcome. This involves the establishment of Interim Management Reports, clear responsibilities and regular, clearly guided telephone conferences and face-to-face meetings.

3.2.1 Interim Management Reports (IMR)

The idea of internal "Interim Management Reports" is to implement a tool, which requires each partner to provide information regarding their past, ongoing and planned work, as well as information on the spent resources in a specific period of time. The IMR is a cumulative report created on a quarterly basis, which all partners contribute to. It is an efficient tool to provide the Project Management Team a good understanding of the status and progress of the work and to detect any possible delays or deviations well in advance. Furthermore, the IMR serves as the basis for the periodic reports to the EC. For this purpose, the Coordinator provides a cumulative template, filled by each partner on the Project SharePoint. The outcome is reviewed by the whole consortium and if shortcomings are identified, the responsible partner is contacted individually and asked to update the report. In the end, the Coordinator prepares the final version and shares it with the EB, asking WP leaders to review their WP description in the report. After that a final .pdf is uploaded to the SharePoint.

WP1 – Project, Risk and Innovation Management [M01-M36]
Overview on Tasks in WP1: **T1.1: Project Management [M01-M36] → TEC** **T1.2: Risk and Quality Management [M03-M36] → TEC** **T1.3: Research and Innovation Management [M01-M36] → VIGO**
Explain the work carried out in WP1 during the reporting period for your beneficiary! <fill in>
Explain the reasons for deviations from the DoA, the consequences and the proposed corrective actions. *Include explanations for tasks not fully implemented, critical objectives not fully achieved and/or not being on schedule. Explain also the impact on other WP/tasks on the available resources and the planning. If yes, please provide the following information:*
<Beneficiary short name> Reason: <fill in if applicable> Consequences: <fill in if applicable> Corrective actions: <fill in if applicable>
For the WP1 leader: Achievements and Results
Summarize the main achievements and results for WP1. ✓ <fill in>

Figure 1: Extract of IMR, Chapter 1

The structure and the target of each section in the IMR are as follows:

Chapter 1 "Explanation of the work carried out by the beneficiaries and overview of the progress (including deviations)" asks for partner information regarding the work performed within the respective quarter. This helps the Project Management Team to monitor partner activities and the progress made within the last quarter. It further asks the WP leader explicitly for the main achievements and exploitable results per WP, in order to have a clear view on the results and how they will impact the ongoing work. For the Coordinator it was also of high importance to add a section,

which gives the partners the opportunity to describe deviations concerning the work plan described in the DoA. In this subsection of each WP partners describe problems they had/have to cope with and that may be related to problems with larger impact. An exemplary extract of Chapter 1 of the IMR is shown in Figure 1.

Chapter 2 of the IMR reports on the status of the deliverables and milestones which were due until the issue of the report, as well as on those due in the upcoming quarter.

Chapter 3 is handling the Risk Assessment of each WP. The process of risk management is described in section 3.3.2.

Chapter 4 of the IMR are dedicated to dissemination, communication, exploitation and standardisation activities carried out in the respective quarter (Chapter 4), while Chapter 5 summarizes the publications (and associated research data) that were submitted until the issue of the IMR or are planned to be submitted in the next quarter.

Chapter 6 is about the use of resources of each partner per WP. This Chapter gives an overview of the total planned person months in comparison to the actual spent person months.

3.2.2 Responsibilities and Internal Review

Transparency of roles and responsibilities has a big impact on the project success. Uncertainty can dramatically affect individual, organisational as well as the consortium's overall performance. Therefore, responsible persons for each organisation and per WP were defined. In a further step, responsibilities for deliverables are defined.

Table 1 lists all deliverables and milestones due within the first 18 months of the project. While the leader of each deliverable has already been set in the DoA, the editor responsible for requesting and guiding partner inputs towards a punctual and high-quality submission, were chosen at the project start or later. In line with the internal review process (described in section 3.3.1) one internal reviewer for each deliverable is defined and clear deadlines for the first draft, the review feedback, as well as for the final version were established.

ACR	Nature	Type	Deliverables and Milestones	WHO	WP	Del. Month	Planend review Start	Deadline	Status
MS1			Successful project start	TEC	ALL	M01		31/10/2023	Achieved
D1.1	SEN	DMP	Data Management Plan	TEC	WP1	M06	10/03/2023	31/03/2023	Submitted
D6.1	PU	R	Plan for dissemination and exploitation including communication activities	TEC	WP6	M06	10/03/2023	31/03/2023	Submitted
D1.2	PU	R	Project quality and risk assessment plan	TEC	WP1	M12	09/09/2023	30/09/2023	Submitted
D2.1	PU	DEM	Growth of VCSEL on Ge by MOCVD and MBE	VIGO	WP2	M13	10/10/2023	31/10/2023	In progress
D3.1	SEN	DEM	Optimization of basic process steps for GeVCSEL wafer process flow	CNRS-LAAS	WP3	M13	10/10/2023	30/10/2023	In progress
MS2			Material science concepts, device formulation,	CNRS-LAAS	WP2, WP3,	M12	09/09/2023	30/09/2023	Achieved

ACR	Nature	Type	Deliverables and Milestones	WHO	WP	Del. Month	Planend review Start	Deadline	Status
			MOCVD & MBE technology completed.		WP4, WP6				
D4.1	PU	R	Characterisation of VCSEL with spontaneously oscillating beam direction	TUL	WP4	M15	10/12/2023	31/12/2023	Upcoming
D3.2	SEN	R	Processing VCSEL devices on Ge wafers	VIGO	WP3	M18	10/03/2024	31/03/2024	Upcoming
D6.2	SEN	R	Updated exploitation plans and long-term roadmap	VIGO	WP6	M18	10/03/2024	31/03/2024	Upcoming
MS3			Integrated devices delivered to demonstrator work packages.	VIGO	WP2, WP3, WP4, WP6	M18	10/03/2024	31/03/2024	Upcoming

Table 1: PhotoGeNIC Deliverables and Milestones Overview

3.2.3 Telephone Conferences & Meetings

Communication is one of the most essential foundations of a successful project collaboration. Therefore, the PhotoGeNIC consortium established regular conference calls (e.g. monthly EB meetings requesting WP status reports, as well as several WP-internal meetings on a regular basis). The Coordinator provides their conf call system. Virtual meetings are planned in parallel to physical meetings, which are needed because of the complexity of this project.

To ensure the project success it is necessary to implement an efficient meeting structure. At the beginning of the PhotoGeNIC project, the kick-off meeting took place virtually on 7th October 2022. From October 27th to 28th, a physical kick-off meeting was held at Technikon in Villach, Austria. Different expectations were discussed among all partners in order to define a definitive plan about the further work plan and required actions.

The Coordinator plans to organize at least two technical meetings per year (either f2f or virtual), combined with General Assembly meetings at the end of each project period or at least once per year (planned venue: online or at a partner's premises). WP-specific or cross-WP meetings will be organized upon request.

At the end of each project period there will be a review preparation meeting shortly before the official review meeting takes place (planned venue: online or EC premises in Brussels or - if necessary – at a partner's premises).

3.3 Quality Control

The scope of quality control is the management of feedback and deviations in the project. Quality control ensures that feedback, from internal, as well as from external advisors, is taken into account and therefore positively influences the work towards the project objectives. Risk management is an integral part of quality control as the proactive notice of deviations from the DoA allows the consortium to mitigate the consequences or even transform the latter into opportunities.

3.3.1 Internal Review Process

To ensure the quality of deliverables, an internal review process was defined. The main goal of this process is to gather internal feedback from partners, who did not directly participate as editor or contributor to the deliverable before its submission to the European Commission. The review process is shown in Figure 2 and explained below.

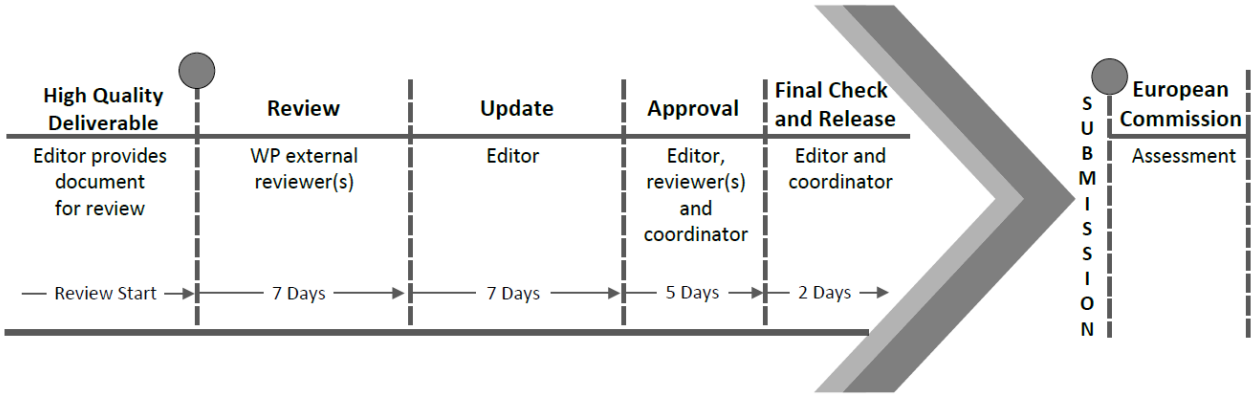

Figure 2: Review and Quality Assurance Process for Deliverables

Step 1 "Review": partners send the High-Quality Deliverable to an internal reviewer, who was not directly involved in the deliverable work and to the Coordinator (*Review = 7 days*). High quality means, that all required input is included within the deliverable, all track changes accepted, and a first formatting check performed. The reviewer reads the High-Quality Deliverable and compares the content against its objective as defined in the work plan. The review result is a draft with mark-up as follows:

- **Word:** The editor protects the draft against changes or – if the deliverable is edited online – the reviewers always activate the "track changes" function. Typos and small changes are directly entered in the text through "track changes", comments are entered as Word comments.

The internal reviewer has to fill in an **Internal Review Form**. The internal review form guides the reviewer through specific questions to make sure that the content complies with the quality claims of the EC (e.g. accordance with the DoA, required information, structure, etc.), as well as the project partners. In this way, the editor of the deliverable receives feedback in a clearly structured form, which helps him to address all comments. Table 2 shows the internal review form used in PhotoGeNIC.

Step 2 "Update": After the review, the editor makes the necessary **changes and updates**. For the update it is important that comments are not removed. Instead, there should first be a discussion between the involved editor/contributors to update the deliverable according to the received comments. Secondly, the editor/contributors either respond to the comments directly or add additional comments on their own. (*Update = 7 days*)

Step 3 "Approval / 2nd review": During the **second review (Approval)** the editor contacts again the reviewers and the Coordinator to check if their comments have been addressed; if required, the reviewer updates the review form and state if the deliverable is ready for submission. (*Approval = 5 days*)

Step 4 "Final Check and Release": The editor performs a **final check** and informs the Coordinator that the deliverable is final. Then the Coordinator performs a final check (incl. formatting updates) and creates the final .pdf document. (*Release = 2 days*)

Step 5 "Submission to the EC": The Coordinator submits the deliverable to the EC by the end of the month.

Review Form
for the Internal Reviewer
PhotoGeNIC deliverable:

*** Type of comments: M = Major comment, m = minor comment, a = advice**

Date of Internal Review:	**Internal Reviewer:**		
	Answer	**Comments**	**Type***
1. Is the deliverable in accordance with			
i. the Description of Action?	Yes No		M m a
ii. the international State-of-the-Art?	Yes No		M m a
2. Is the quality of the deliverable such			
i. that it can be sent to the EC?	Yes No		M m a
ii. that it needs no further editing?	Yes No		M m a
iii. that the content does not need to be improved?	Yes No		M m a
3. Does the deliverable include			
i. a clear structure (e.g. appropriate, understandable presentation of the work performed)	Yes No		M m a
ii. a sufficient and meaningful executive summary	Yes No		M m a
iii. an appropriate introduction	Yes No		M m a
iv. a meaningful summary & conclusion	Yes No		M m a

Table 2: PhotoGeNIC Internal Review Form

3.3.2 Risk Management

To guarantee the achievement of the objectives of the PhotoGeNIC project, it is essential to identify and understand the significant project risks.

The continuous risk management process is based on the early identification of, and the fast reaction to, events that can negatively affect the outcome of the project. The frequent meetings of the project

bodies therefore serve as the main forum for risk identification. The identified risks are then analysed and graded, based on impact and probability of occurrence.

Technical risks were analysed and graded, based on their probability of occurrence in order to answer the governing question: “How big is the risk and what is its impact?” Knowing how a risk impacts the project is important as several risks of the same type can be an indication of a larger problem.

The risks defined in the DoA, will be graded into low/medium/high risk levels.

low	Low probability of occurrence and low impact
medium	Low/high probability of occurrence and High/low impact
high	High probability of occurrence and high impact

The risks will be monitored on a regular basis and an updated risk table will be provided within the Periodic Reports. Further, a detailed classification and evaluation will be provided within Chapter 4 and Chapter 5. The Risk Assessment Plan will show how potential risks are assessed and mitigated in order to avoid any negative influence on the PhotoGeNIC project objectives.

In addition to the above-mentioned tools and procedures, the project partners’ and the coordinator’s profound experience with H2020 and Horizon Europe projects implicates a high level of competence, expert knowledge, skills and qualifications, which further increases the quality of the project work. Furthermore, besides these hard skills, also soft skills, such as motivation, team spirit, and interpersonal interaction contribute to high quality project performance.

3.3.3 Advisory Board

The consortium will be supported and advised by an external Advisory Board (AB), consisting of selected organisations and experts not directly involved in the project as partners. Their valuable feedback to the scientific and technical project progress will bring many benefits for PhotoGeNIC. The advisors will provide an external unprejudiced view without receiving funding form the European Commission. To achieve high quality results within the PhotoGeNIC project, a strong cooperation with the AB members will actively be pursued and facilitated by frequent interaction in the form of conference calls or written feedback rounds. The consortium plans to meet with the Advisory Board approximately once per year. If there is a need to share confidential information with the AB members, the Coordinator will ensure that a Non-Disclosure Agreement (NDA) is executed between the consortium and each member of the Advisory Board.

Through the involvement of external advisors, interim feedback of enormous importance regarding the overall orientation of the project outcome is expected. This supports the path towards objectives and controls the quality of the project work, as well as the quality of expected outcomes.

Chapter 4 Risk Management Procedure

According to the ISO 31000 standard on risk management, a risk can be defined as an “effect of uncertainty” towards parts of objectives. An effect is described as a positive or negative deviation from the expected work plan. Every step towards the project objectives has an element of risk that needs to be managed. In the context of risk management, uncertainty exists whenever the knowledge or understanding of an event, consequence, or likelihood is inadequate or incomplete. Risk management describes a coordinated set of activities and methods, which supports the control of risks that may prevent the project from achieving its objectives. The risk management process is meant to form part of the project management routine at all stages of the project lifecycle [1].

This chapter focuses on the risk management procedure that systematically applies management policies, processes, and practices on project activities. Risk management is a separate task within Work Package 1 of the PhotoGeNIC project (Task 1.2), led by the coordinator support TEC.

For PhotoGeNIC, a risk management framework based on three major pillars, which continuously correlate with each other, is established:

1. Risk identification (Section 4.1)
2. Risk analysis & monitoring (Section 4.2)
3. Risk treatment (Section 4.3)

The risk management needs to be aligned with the project objectives and might be adjusted - if required - due to changes in the research objectives. It was established around the daily project work and will accompany the project during its entire lifetime.

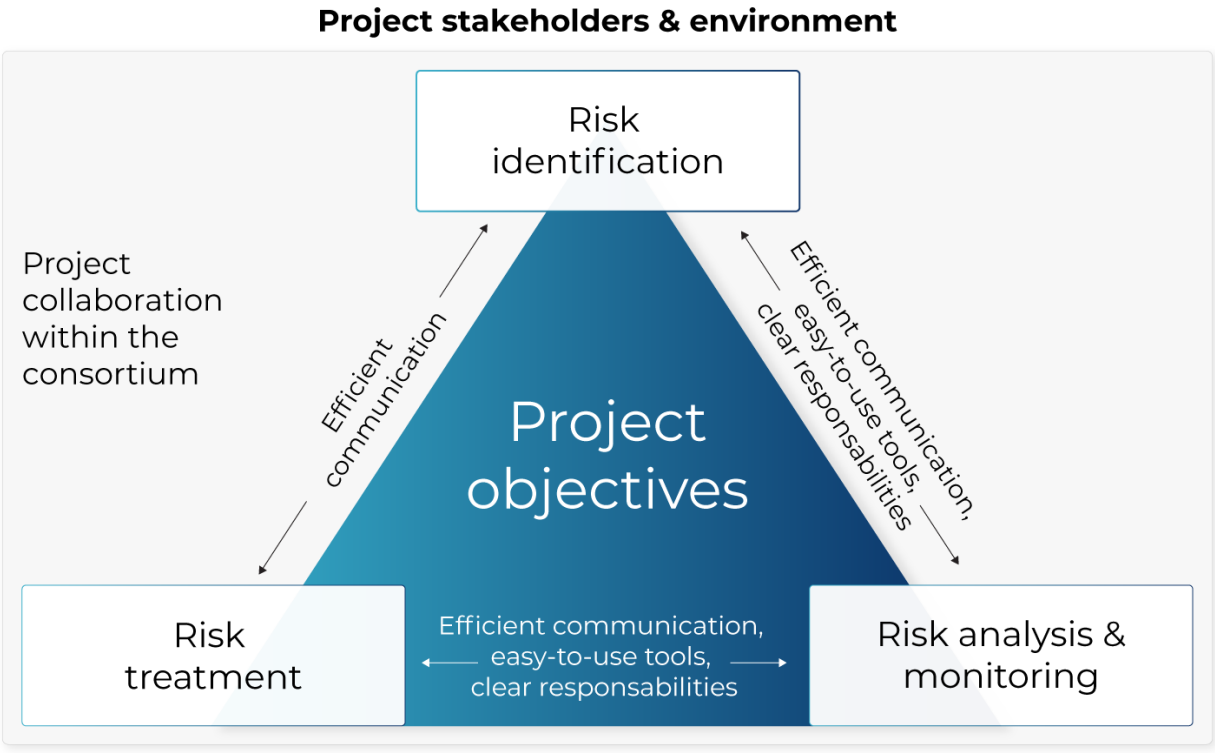

Figure 3: Risk Management Procedure

Taking into consideration all factors external to the project, channels that allow the efficient implementation of the three major steps in the shown risk management procedure, have to be established. On the one hand, a clear structure for communicating risks including clear responsibilities are required and need to be aligned with all partners. On the other hand, it has to be easy for the partners to perform risk management by themselves through easy-to-use tools.

How the above-mentioned tools and steps were integrated into the project and how they will support to mitigate negative consequences for the project, is described within the following subchapters.

4.1 Risk Identification

"Risk identification is a process that is used to recognize, find, and describe the risks that could affect the achievement of objectives." [1]

The target of risk identification is to become aware of possible risk sources in addition to the events and circumstances that could affect the achievement of objectives. Further, it includes the identification of possible causes and consequences.

The identification of risks started during the proposal phase. While developing the idea for an innovative technological advancement, risk identification needs to become aware in a way that creates the most value at an acceptable level of risk. In such a highly innovative field that PhotoGeNIC is contributing to, it is necessary to have experts, who understand the technical challenge and its impact besides deep insights into the industrial and market needs. The PhotoGeNIC consortium combines all these skills and is therefore capable of identifying the risks within the project.

Risk identification has not been terminated after the proposal preparation phase but is rather a continuous process of raising awareness of potential risks. To address this awareness in an optimal way, the consortium defined the WP leaders as risk managers for their WPs. The WP leader is an expert in the field his or her WP is focusing on and therefore, the most capable person to identify risks. On project level, the technical leader VIGO and the coordinator TEC pay attention to the identification of potential risks. This is done by means of Interim Management Reports, regular technical progress conf calls and face-2-face meetings. This distribution of responsibilities helps the consortium to identify new risks if needed and encourages the discussion of potential risks within conf calls, face-to-face meetings and within the WPs.

The risk table shown in Chapter 5 allows all partners to add new risks at any time. Additionally, the coordinator requests partners to assess risks on a regular basis within the Interim Management Report (IMR), which is filled in by all project partners on a quarterly basis.

4.2 Risk Analysis and Monitoring

"Risk analysis is a process that is used to understand the nature, sources, and causes of the risks that have been identified and to estimate the level of risk. It is also used to study impacts and consequences and to examine the controls that currently exist. To monitor means to supervise and to continually check and critically observe - it means to determine the current status." [1]

The process of risk analysis and monitoring is iterative, which means that the risks are evaluated, mitigation measures are re-considered and updated, if necessary, and the progress is monitored on a regular basis. Interim Management Reports (described in Section 4.2.2) serve as main tool for regular analysis and monitoring.

Before setting up the structure and requesting inputs from the project partners, we faced the challenge of making our risks measurable and tangible. While a merely quantitative approach is not applicable due to the high degree of innovation, a pure qualitative approach would be hard to evaluate. Therefore, a mixture of quantitative and qualitative elements was chosen and is described in the following Section.

4.2.1 Quantitative and qualitative approaches to risk analysis

"Qualitative Risk Analysis assesses the priority of identified risks using their probability of occurrence, the corresponding impact as well as other factors such as the time frame and risk tolerance. When using quantitative analysis, the risk level can be estimated by using statistical analysis and calculations combining severity and probability." [1]

While qualitative risk analysis is performed for all project risks, quantitative risk analysis has a more limited use within the PhotoGeNIC project, based on the type of project risks, and the limited availability of data to conduct a quantitative analysis. However, the WP leaders are asked to indicate probability and severity of the stated risks, which have been identified in the previous step.

Probability describes the relative likelihood that a risk will eventuate. It can be defined, determined, measured objectively or subjectively and can be expressed either qualitatively or quantitatively. [1] The probability may be dependent on various factors like the project environment, consortium characteristics, external effects, technological breakthroughs etc. For the evaluation of the PhotoGeNIC project risks the following classifications were defined:

- **Low -** Below *<30%>* probability of occurrence
- **Medium -** Between *<30%>* and *<70%>* probability of occurrence
- **High -** More than *<70%>* probability of occurrence

Severity defines the effects and consequences a project may face in case of risk occurrence. The severity may be influenced by various risk triggers arising from the project environment, consortium characteristics, external effects, technological breakthroughs etc. and may affect the technological and financial performance as well as the schedule of the project. [1]

- **Marginal -** Risk has relatively little impact on the project's technological and financial performance as well as the schedule
- **Critical -** Risk has the potential to impact the project's technological and financial performance as well as the schedule
- **Catastrophic -** Risk has the potential to greatly impact the project's technological and financial performance as well as the schedule

Classifying risks with the indicated scale, allows the assessment of any responsive action that might be needed. The qualitative analysis further includes: (a) if the risk is (still) relevant (yes/no), (b) if the risk did materialise, as well as (c) an update of the risk. This is used as basis for the decision if measures need to be taken in a further step. The description of the current risk status also supports the deeper understanding and specification of the risk. At this point quantitative elements step in. The detailed assessment of the risk may include explanations of further effort requests, additional expenses, etc. needed to deal with the risk consequences, which makes it quantitatively measurable.

The practical implementation of the qualitative and quantitative analysis within the PhotoGeNIC project can be found in Chapter 5.

4.2.2 Interim Management Reports

Interim Management Reports (IMR) serve as continuous internal quality control and risk monitoring and assessment tool. IMRs were established by the coordinator TEC to ensure that the work progress and the efforts spent are reasonable and in line with the expectations. They also support the early recognition of deviations and potential risks for the project.

As preparation for the Periodic Reports, the IMRs also request partners to update dissemination and exploitation activities, which implies the continuous update of the project website and social media accounts. The structure of the IMR includes reports on the following key points:

- Explanation of the work carried out by the beneficiaries and overview of the progress including use of resources and deviations;
- Risk Assessment within every WP;
- Update of Dissemination, Exploitation, Standardization and Cooperation activities;

The structure proved to be effective in various projects and an easy management tool accepted by all project partners. Partners are requested to provide input to the IMRs after each quarter (e.g. M01-M03, M04-M06 etc.). All inputs are collected and compiled by TEC. The cumulative outcome of the IMR serves as an overview of ongoing project issues for all PhotoGeNIC partners and raises awareness for potential challenges.

Further, the IMR allows a check if the partners' work is performed as planned in the DoA. This also minimizes the risk of underperforming partners, deviations in terms of efforts and allows early detection of potential delays. Furthermore, regular progress telephone conferences give an update on the WP status and the partners' work, which allows the assessment and identification of further risks and timely corrective actions if needed.

The effort reported (PMs/partner/WP) in the IMR is collected in a cumulative table that generates diagrams for a swift and easy understanding of over- and underspending of resources per partner as well as on WP level. Consequently, the critical key indicators in terms of efforts are clearly visible and possible actions can be taken in due time.

Risk assessment includes the evaluation of the already stated risks according to the current status of the project by the WP leaders as well as the additions of unforeseen or potentially upcoming risks. Those inputs were included into the overall risk assessment map and after evaluation it will be decided if it is necessary to request measures or to iteratively continue with the analysis and monitoring process.

4.3 Risk Mitigation Measures

The process of risk treatment starts once a risk is assessed as likely to occur (medium/high) and has an impact/severity (critical/catastrophic) on the project. At this point the WP leader correlates with the technical leader and the coordinator to define

- if counter-steering measures need to be taken, and
- which project level (project bodies) will be appropriate to deal with the risk.

If the risk has no major impact on the project and appropriate actions can be taken by the WP leader, the risk will be handled on this level. In case a risk is expected to create major impact on the project, the Executive Board (EB) or the General Assembly (GA) will be involved. In case of substantial risks or major delays, the coordinator also informs the Project Officer and provides a brief assessment of the situation. Therefore, the structure of the project bodies and the clear definition of responsibilities for each project body, defined during the proposal phase, allow a clear and swift communication of risks.

The governing culture of PhotoGeNIC is based on democracy, co-determination and clear leadership. Each body operates on separate levels and has its own area of responsibility and decision-making power. Based on the expected impact of a risk, the coordinator will assemble the EB or GA in a telephone conference to discuss counter-steering measures. For risks that affect the overall strategy, and may threaten part of the project outcomes, the GA, as the highest decision-making body, will deal with this risk. Risks causing minor delays or minor changes in the work plan will be handled by the EB.

The GA and EB members are experts in their fields and therefore, capable of estimating the effects of the risks as well as of countermeasures. The responsible body discusses if the already proposed mitigation plan is still suitable or if other actions need to be taken or are more suitable to the risk occurred. The decision regarding the countermeasures will be taken according to the voting rules defined in the Consortium Agreement. The WP leaders are in charge of the appropriate realization

of the defined risk mitigation measures. All applied measures, arising challenges or changes will be documented in the risk table.

Besides the decision-making bodies in the PhotoGeNIC structure, an Advisory Board supports the consortium with an external, unprejudiced view. This can also be seen as a risk minimizer as it makes sure that the project outcomes will meet the market expectations and do not fail to meet substantial market-specific needs.

Chapter 5 Managing PhotoGeNIC Risk

This chapter illustrates the implementation of the previously described risk tools within the PhotoGeNIC project. It presents the defined risks, shows the development of the risks based on probability & severity/impact estimations at several evaluations and assesses the current status of the risk. Since the WP leaders are the main responsible persons for the risks within their WPs, this chapter is built on WP level.

As described in detail in Chapter 4.2, a probability/severity analysis is used to qualitatively evaluate the risk status. The scale for probability was defined as low, medium, or high. The scale for severity/impact was defined as marginal, critical, and catastrophic. Both parameters are illustrated in the table below:

	Low	**Medium**	**High**
Probability	Less than *<30%>* probability of occurrence	Between *<30%>* and *<70%>* probability of occurrence	More than *<70%>* probability of occurrence
	Marginal	**Critical**	**Catastrophic**
Severity/Impact	Risk has relatively little impact the projects technological and financial performance as well as the schedule	Risk has the potential to impact the projects technological and financial performance as well as the schedule	Risk has the potential to greatly impact the projects technological and financial performance as well as the schedule

Table 3: Probability/severity matrix

Risks with a high level of probability and/or severity are monitored very closely. They are subject to review in monthly technical progress telephone conferences. Furthermore, the project management team is continuously in contact with the WP leader to monitor the development of such risks.

The detailed risk assessment on WP level was performed regularly during the first project year. None of the risks identified prior to the project start materialized during the first project year.

The PhotoGeNIC project management team is going to proceed with the risk assessment on WP level on quarterly basis throughout the project lifetime. To support the WP leaders with their risk assessment and to help them fill in the complex risk assessment template, TEC illustrated the risk assessment process (see Figure 4). WP leaders have to respond to questions like:

a) Is the risk still relevant?
b) Probability: How likely will the risk occur? Low, Medium, High
c) Severity/Impact: Marginal, Critical, Catastrophic
d) Did the risk materialise? (Yes/No)
e) Please provide a short update of the risk.
f) Did you apply risk mitigation measures? (Yes/No)
g) If the risk-mitigation measures could not be applied, please explain why.

Only if the risk materialised:

h) Explain the reason why it materialised
i) What are the consequences?
j) What are the corrective actions & updated mitigation measures?

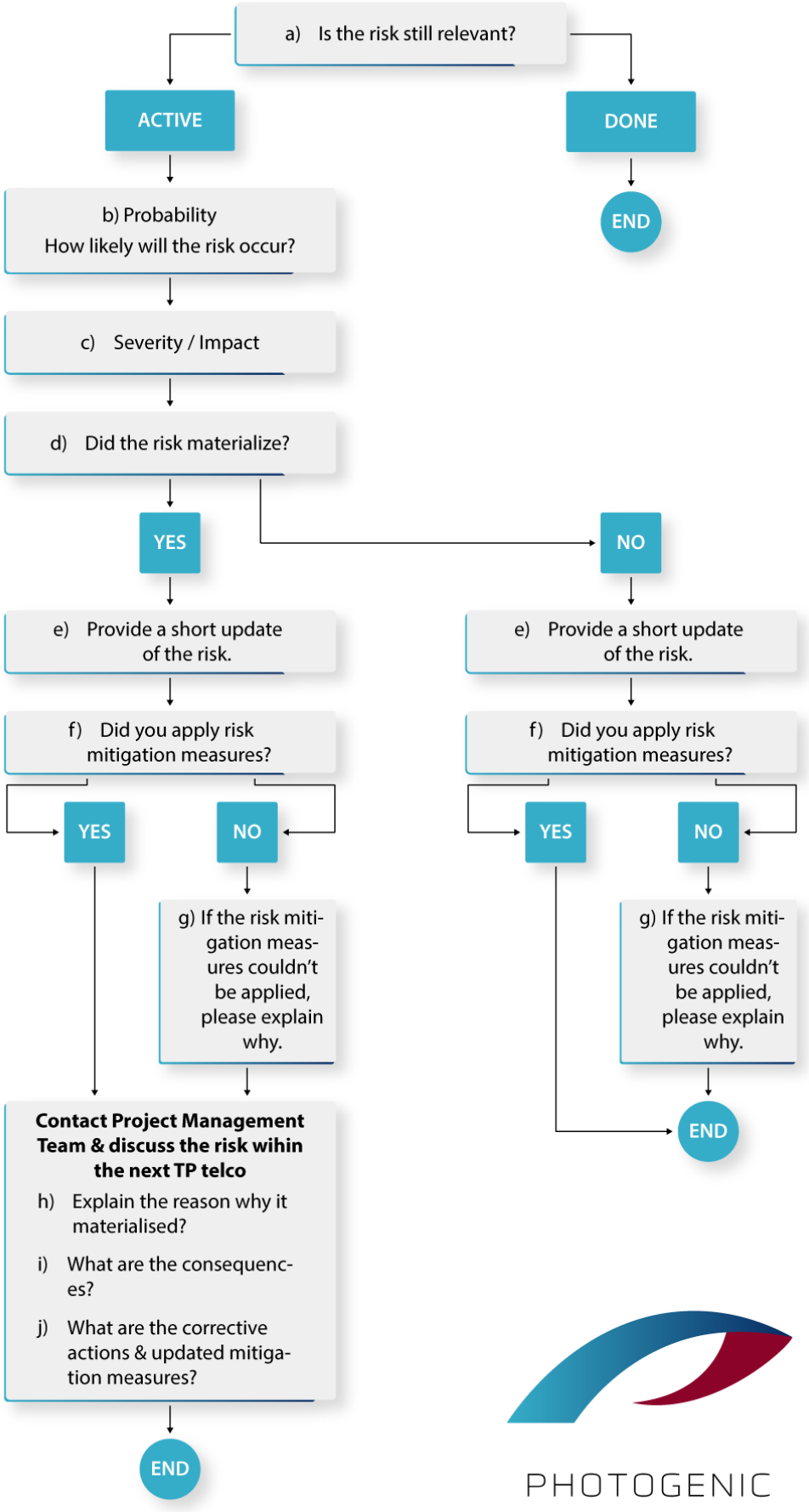

Figure 4: PhotoGeNIC Risk Assessment Map

5.1 WP1

During the proposal phase two risks were pre-defined in WP1. In the first year of the project, none of the defined risks have occurred at present due to sufficient measures.

Risk Evaluation Form WP1		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise ? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/ weren't applied, please explain why.**
RTD efforts are not reaching technical targets in WP1	Technology leader is present in all technical meetings and involves experts if necessary. Continuous internal progress control (IMR) and risk assessment.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A
Conflicts in consortium (technical, administrative) in WP1	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A

5.2 WP2

During the proposal phase six risks were pre-defined in WP2. In the first year of the project, none of the defined risks have occurred at present due to sufficient measures.

Risk Evaluation Form WP2		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise ? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/ weren't applied, please explain why.**
Improper technology selection associated with device performance requirement	Two alternative technologies were proposed MOCVD and MBE.	September 2023	Yes	Medium	Marginal	No	Longer MBE machine maintenance than expected – to be monitored	Yes	N/A
Low VCSEL/Ge material quality vs VCSEL/GaAs	Further optimization of the growth process, development of Ge substrates.	September 2023	Yes	Low	Marginal	No	Optimization process successful, to be continued.	Yes	N/A
Insufficient VCSEL/Ge performance in comparison to VCSEL/GaAs in WP2	Extended material characterization using VIGO, CNRS-LAAS, PMD, TUL resources in order to understand the growth issues.	September 2023	No	High	Critical	No	To early stage to assess	Yes	N/A
Ge substrates quality below expectation in WP2	UMICORE has highly skilled and experienced specialists to be allocated for the project.	September 2023	No	Low	Critical	No	On the basis of performed experiments there is no risk of the quality below expectations.	Yes	N/A

Risk Evaluation Form WP2		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise ? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/ weren't applied, please explain why.**
RTD efforts are not reaching technical targets in WP2	Technology leader is present in all technical meetings and involves experts if necessary. Continuous internal progress control (IMR) and risk assessment.	September 2023	Yes	Low	Critical	No	Systematic meetings. The last one during VCSEL Day in Torino	Yes	N/A
Conflicts in consortium (technical, administrative) in WP2	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Marginal	No	Collaboration is very good and efficient. Systematic meetings of the consortium members to discuss the results and plan next steps.	Yes	N/A

5.3 WP3

Seven risks were pre-defined in WP3. In the first year of the project, one additional risk was identified and included in the risk assessment. None of the eight risks have occurred at present due to sufficient measures.

Risk Evaluation Form WP3		Current assessment of risk							
Description of risk	Proposed risk-mitigation measures	Date of last evaluation	a) Is the risk relevant ?	b) Probability How likely will the risk occur?	c) Severity/ Impact	d) Did the risk materialise ? (Yes/No)	e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	f) Did you apply risk mitigation measures ? (Yes/No)	g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
Insufficient VCSEL/Ge performance in comparison to VCSEL/GaAs in WP3	Extended material characterization using VIGO, CNRS-LAAS, PMD, TUL resources in order to understand the growth issues.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A
Insufficient VCSEL/Ge performance in comparison to VCSEL/GaAs	Further optimization of ohmic contacts technology, oxidation process and process flow design. Alternative and comparative works on the processing in collaboration with external partners.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A
The difficulty of observing Fano resonance or low-quality factor Fano resonance in WP3	Further optimization of the periodic structures processing in recurrence loops composed of simulations, fabrication and characterization.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A

Risk Evaluation Form WP3		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise ? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.**
The difficulty in achieving expected beam steering in WP3	Further optimization of the shape and dimensions of the oxide apertures and scheme of current injection.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A
Ge substrates quality below expectation in WP3	UMICORE has highly skilled and experienced specialists to be allocated for the project.	September 2023	Yes	Low	Critical	No	Ge substrates exhibit good enough quality.	Yes	N/A
RTD efforts are not reaching technical targets in WP3	Technology leader is present in all technical meetings and involves experts if necessary. Continuous internal progress control (IMR) and risk assessment.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A
Conflicts in consortium (technical, administrative) in WP3	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A
Machine maintenance critical problems, longer spare parts lead times from suppliers, energy supply breakdown	Transfer process tasks to other PhotoGeNIC partners equipped with equivalent processing tools. Support from other technological platforms within the French RENATECH network.	September 2023	Yes	Medium	Catastrophic	No	N/A	Yes	N/A

5.4 WP4

For WP4, four risks were defined in the proposal phase. In the first year of the project, none of the defined risks have occurred at present due to sufficient measures.

Risk Evaluation Form WP4		Current assessment of risk							
Description of risk	Proposed risk-mitigation measures	Date of last evaluation	a) Is the risk relevant ?	b) Probability How likely will the risk occur?	c) Severity/Impact	d) Did the risk materialise ? (Yes/No)	e) Please provide a short update of the risk: (e.g.: What has happened ?, Why is it (not) relevant at the moment?, etc.)	f) Did you apply risk mitigation measures ? (Yes/No)	g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
The difficulty of observing Fano resonance or low-quality factor Fano resonance in WP4	Further optimization of the periodic structures processing in recurrence loops composed of simulations, fabrication, and characterization.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A
The difficulty in achieving expected beam steering IN WP4	Further optimization of the shape and dimensions of the oxide apertures and scheme of current injection.	September 2023	Yes	Medium	Critical	No	N/A	Yes	N/A
RTD efforts are not reaching technical targets in WP4	Technology leader is present in all technical meetings and involves experts if necessary. Continuous internal progress control (IMR) and risk assessment.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A
Conflicts in consortium (technical, administrative) in WP4	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Critical	No	N/A	Yes	N/A

5.5 WP5

A total of five risks were pre-defined for WP5. None of the defined risks have occurred at present, as the main work of this WP will happen in the upcoming months of the project. The consortium, especially the Xeno and PMD will continue the risk assessment throughout the project.

Risk Evaluation Form WP5		Current assessment of risk							
Description of risk	Proposed risk-mitigation measures	Date of last evaluation	a) Is the risk relevant ?	b) Probability How likely will the risk occur?	c) Severity/ Impact	d) Did the risk materialise ? (Yes/No)	e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)	f) Did you apply risk mitigation measures ? (Yes/No)	g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.
Driver PCB for VCSEL array cannot deliver adequate V, I in function of the VCSEL characteristics and the defined pulse regime hence not meeting the demonstrator targets	Custom PCB will be replaced by setup based on specific power supplies complying to the driver requirements in function of the pulse regime, to enable the qualification of the demonstrator.	September 2023	Yes	Medium	Critical	No	First VCSEL devices reduced the risk	No	Not necessary
Thermal behavior influences strongly the VCSEL based projector optical output characteristics, hence impacting performance of the demonstrator	XENO has substantial experience with thermal management of VCSEL based projector (currently GaAs): simulation, design solutions.	September 2023	Yes	Medium	Critical	No	N/A	No	Not necessary
Aging behavior of the VCSEL chip is restricting the practical usage	Root cause analysis and accelerated lifetime test can identify key parameters to improve the aging characteristics.	September 2023	Yes	Medium	Critical	No	N/A	No	Not necessary
RTD efforts are not reaching technical targets in WP5	Technology leader is present in all technical meetings and involves experts if necessary. Continuous internal progress control (IMR) and risk assessment.	September 2023	Yes	Low	Marginal	No	N/A	No	Not necessary

Risk Evaluation Form WP5		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise ? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.**
Conflicts in consortium (technical, administrative) in WP5	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Marginal	No	N/A	No	Not necessary

5.6 WP6

In the proposal phase, a total of three risks were developed for WP6. As of today, none of these risks have materialized, as the WP6 Lead always monitors the progress of the work and thus the communication and dissemination activities are always on track and no conflicts arise between the partners or with regard to IPR.

Risk Evaluation Form WP6		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.**
IPR conflicts between partners or between groups of partners	Early detection through good contacts, frequent meetings, and an unambiguous legal framework (e.g., CA) and potential bilateral agreements. The coordinator, as independent entity, has acted successfully as IPR mediator between before.	September 2023	Yes	Low	Critical	No	Partners collaboration is very efficient and reasonable.	Yes	N/A
Dissemination/ Communication/ Exploitation is out of plan	The Task Leader monitors the activities and will react fast. The dissemination and exploitation plans are clearly structured and provide a flexible monitoring tool. WP meetings will find solutions.	September 2023	Yes	Low	Critical	No	The Task leader monitors the activity systematically and the works are realized according to the schedule. Upcoming results are planned to disseminate.	Yes	N/A

Risk Evaluation Form WP6		Current assessment of risk							
Description of risk	**Proposed risk-mitigation measures**	**Date of last evaluation**	**a) Is the risk relevant ?**	**b) Probability How likely will the risk occur?**	**c) Severity/ Impact**	**d) Did the risk materialise? (Yes/No)**	**e) Please provide a short update of the risk: (e.g.: What has happened?, Why is it (not) relevant at the moment?, etc.)**	**f) Did you apply risk mitigation measures ? (Yes/No)**	**g) If the risk-mitigation measures couldn't be applied/weren't applied, please explain why.**
Conflicts in consortium (technical, administrative) in WP6	Conflict management through close and good contacts, frequent meetings.	September 2023	Yes	Low	Critical	No	N/A	Yes	N7A

Chapter 6 Summary and Conclusion

This Project Quality Plan demonstrates that quality aspects are taken into account in a variety of processes and activities within the PhotoGeNIC project. The interrelated quality processes – planning, assurance, and control – impact the project work from its start to its end. The project aims at obtaining a high degree of quality, where outcomes are achieved in terms of the effectiveness and efficiency of working practices, as well as products and standards of project deliverables and outputs. This plan seeks to establish the procedures and standards to be employed in the project, and to allocate responsibility for ensuring that these procedures and standards are followed. The project management team (Coordinator and Technical Lead) monitors that the above-described processes are fulfilled. In case of any deviations to the planned work the management team is in charge of taking necessary mitigation measures. The plan is effective throughout the lifetime of the project but is open to revision if necessary. Responsibilities for quality planning, assurance and control are shared between all partners, which allow various views on quality issues in order to reach the optimal outcome.

The described Risk Management Plan shows how the PhotoGeNIC consortium deals with challenges and risks on its road to success. Based on theoretical inputs (see Chapter 4), the PhotoGeNIC risk management aims at professionally identifying, analysing, monitoring and treating project risks. It includes appropriate mitigation measures and requires a close collaboration between all project bodies to implement these measures.

The consortium was very effective when monitoring the project risks within the first year of this project. As a result of the continuous risk monitoring, partners rated the current risk assessment. The risk assessment of the first project year showed that none of the risks materialized.

Risk management is a process that is going to be pursued throughout the whole lifetime of the PhotoGeNIC project. The three steps of identification, analysis & monitoring and treatment are going to be regularly performed by all project partners and reported within the Periodic Reports.

Chapter 7 Bibliography

[1] ISO, ‘ISO 31000 - Risk management’, 2018. https://www.iso.org/iso-31000-risk-management.html (accessed June. 29, 2023).