NEXUS

D1.1 PROJECT MANAGEMENT – HANDBOOK 1ST RELEASE

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NEXUS

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03	28/03/2025	Pietro De Vito	Integration of comments by the 2nd Reviewer
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APPROVED FOR SUBMISSION BY

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Executive summary

The D1.1 NEXUS Project Management – Handbook 1st release (henceforth simply Handbook) serves as the foundational guide for effectively coordinating and managing the NEXUS project, an ambitious initiative under Horizon Europe aimed at revolutionizing metro transport systems. With rapid urbanization and increasing demands on public transit, NEXUS seeks to leverage artificial intelligence (AI) and optimization models to enhance operational efficiency, improve passenger experience and strengthen cybersecurity. The project, which began on 1st October, 2024, spans 24 months and brings together a diverse consortium led by STAM.

A robust governance and communication framework ensures seamless coordination across the NEXUS consortium. The Project Coordination Team manages daily operations, while the Steering Committee oversees technical progress, and the General Assembly handles high-level decision-making. Ethical oversight is provided by an Ethics Committee and an External Advisory Board to ensure compliance with regulations. To maintain alignment, clear communication protocols have been established. Regular General Assembly meetings enable strategic reviews, while monthly Steering Committee meetings keep research and development on track. A structured internal communication system and external engagement strategy facilitate collaboration between project partners, metro operators, and regulatory bodies.

Quality assurance is another key priority. A structured peer review process ensures that all project deliverables meet the highest standards, aligning with NEXUS's mission and the expectations of the European Commission. Alongside this, a risk management strategy has been carefully designed to identify potential challenges and implement mitigation measures to keep the project on course.

Financial oversight is equally critical. The project employs a dual reporting system, consisting of continuous reporting and periodic reporting. These reports are managed through the EU Funding & Tenders Portal, ensuring accountability and compliance with funding requirements. Furthermore, budget flexibility measures allow for dynamic resource allocation, ensuring that funds are used efficiently while maintaining the integrity of the project's objectives.

As a living document, the Handbook will evolve throughout the project's lifespan, incorporating lessons learned and adapting to new challenges. Indeed, the final version D2.1 – "Project Management - Handbook 2nd release" will be released in M24. By establishing clear governance, communication, quality assurance, and risk mitigation strategies, the Handbook provides a strong foundation for NEXUS to achieve its goal of transforming urban metro systems through technological innovation and collaborative research.

Social Media link:

@nexus-project

For further information please visit nexus-project.eu

LIST OF ABBREVIATIONS AND ACRONYMS

Acronym	Meaning
AI	Artificial Intelligence
EAB	External Advisory Board
EC	European Commission
EU-Rail	Europe's Rail Joint Undertaking
GA	Grant Agreement
IEA	Independent Ethics Advisor
KoM	Kick-off Meeting
KPI	Key Performance Indicator
PO	Project Officer
RP	Reporting Period
SC	Steering Committee
WP	Work Package

1 INTRODUCTION

The NEXUS project is an ambitious and transformative initiative that aims to innovate and optimize metro transport systems through the integration of cutting-edge technologies, including artificial intelligence (AI) and data-driven decision-making tools. As urban mobility faces increasing demands, the need for efficient, sustainable, and resilient transport systems has never been more critical. NEXUS seeks to address these challenges by developing a comprehensive framework that enhances operational efficiencies, improves passenger experiences, and bolsters cybersecurity and data privacy within metro networks.

Co-funded by the European Commission, NEXUS unites a diverse consortium of experts from academia, industry, and the public sector across Europe. This collaborative model enables the development of technically robust and ethically sound solutions. The project is organized into a series of interlinked Work Packages (WPs), each dedicated to a key component of metro system modernization—ranging from system modelling and AI optimization to validation, cybersecurity, and stakeholder engagement. The Work Package structure, illustrated in the figure below, reflects the integrated and modular approach of the project, ensuring that each aspect of the system is addressed in a coordinated and coherent manner.

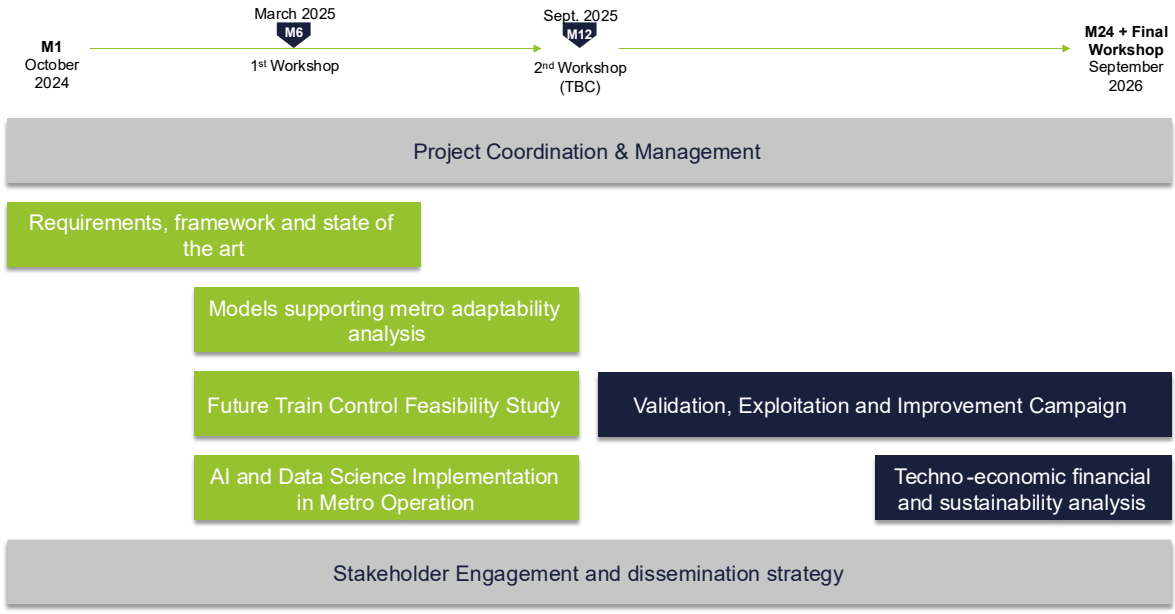

Figure 1 – NEXUS High-level timeline

The complexity of NEXUS requires a well-defined management and communication structure to ensure that all partners are effectively aligned and that each deliverable meets the high standards expected by the consortium and the EC. This Handbook serves as the foundational document outlining the

governance structure, quality management processes, communication protocols, deliverable review mechanisms, and risk management strategies that will guide NEXUS's execution.

1.1 PURPOSE OF THE DOCUMENT

The Handbook is the first deliverable in a series intended to establish and refine the operational framework of the NEXUS project. This document provides the consortium with a structured guide for managing the project's workflows, communication, and decision-making processes. By setting clear expectations and guidelines, it aims to foster a collaborative environment that enables all partners to contribute effectively to the project's success.

This Handbook will be periodically updated to reflect evolving project needs, lessons learned, and any necessary adjustments to the management processes as NEXUS progresses. Through continuous refinement, the Handbook ensures that NEXUS remains responsive to the challenges and opportunities encountered over the project lifecycle.

1.2 DOCUMENT STRUCTURE

This document is organized into several key sections:

1. **Quality Management Plan**: Describes the management structure of NEXUS, detailing the roles and responsibilities of each governance body and the mechanisms for ensuring project objectives are met with high standards.
2. **Communication and Collaboration**: Outlines the communication protocols and meeting structures that will be followed by the consortium to ensure transparency, timely decision-making, and active engagement across all partners.
3. **Deliverable Review Process**: Defines the structured peer review process for all project deliverables, establishing quality checkpoints to ensure that outputs meet project standards and align with strategic goals.
4. **Risk Management Strategy**: Identifies potential risks to the NEXUS project and presents a proactive approach to managing these risks, with detailed mitigation measures to address both internal and external challenges.

The Handbook is intended to be a living document, serving as a reference for all NEXUS partners and guiding the project towards achieving its vision of transforming urban transport systems for the betterment of cities and their inhabitants.

2 QUALITY MANAGEMENT PLAN

The Consortium structure and activities must be in line with the two official documents:

- Grant Agreement, which is the contract between the Consortium and the EU-Rail.
- Consortium Agreement, which is the contract between the beneficiaries of the project.

The Grant Agreement defines the work that each beneficiary commits to carry out during the EU-funded project. It is based on the successful proposal.

The GA lists the project partners (the 'beneficiaries') and specifies the project activities, the duration, budget, EU contribution, all rights and obligations. A detailed explanation can be found in the Horizon Europe annotated model grant agreement[1].

In addition, a Project Officer was assigned at EU-Rail to accompany the consortium during project implementation.

2.1 NEXUS MANAGEMENT STRUCTURE

The governance structure of the NEXUS project is designed to ensure effective coordination, oversight, and ethical compliance throughout the project's lifecycle. This structure consists of various committees, roles, and reporting lines that enable streamlined communication and decision-making, ensuring that all project objectives and obligations are met. The main components of the NEXUS governance structure are as follows:

1. **Project Coordination Team** (Led by STAM)
    - The Project Coordination Team, managed by STAM, serves as the central body responsible for the day-to-day management and coordination of NEXUS. This team ensures that all activities align with the project's strategic objectives, timeline, and budget.
    - The team is directly accountable to the Project Officer and serves as a liaison with the EC, addressing any issues raised by reviewers and ensuring regulatory compliance.
    - Three key coordinators oversee specific project domains:
        - **Umberto Battista, Project Coordinator** – Responsible for overall project leadership and ensuring that all project components are effectively aligned and integrated.

[1] https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/common/guidance/aga_en.pdf

- **Pietro De Vito, Technical Coordinator** – Focuses on the technical aspects of NEXUS, overseeing the development, implementation, and technical alignment across WPs.
- **Stefania Marongiu, Administrative Coordinator** – Manages administrative and financial tasks, ensuring efficient resource allocation and compliance with financial regulations.

2. **Steering Committee** (WP Leaders)
    - Comprised of the leaders of each WP (WP), the Steering Committee (SC) is tasked with technical and scientific coordination across project activities. This committee meets to discuss progress, identify challenges, and ensure consistency and quality across all WPs.
    - The SC reports to the Project Coordination Team and helps guide strategic decision-making, leveraging expertise from all WPs to achieve project goals.
3. **General Assembly** (All Partners)
    - The General Assembly includes representatives from all project partners, providing a forum for broader collaboration and decision-making. It convenes periodically to review project progress, approve major changes, and align partners on the strategic direction of NEXUS.
    - This body ensures that all partners are engaged and aligned with the project's vision and objectives.
4. **Ethics Committee** (TIS, STAM, Independent Ethics Advisor)
    - The Ethics Committee, including members from TIS, STAM, and an Independent Ethics Advisor (IEA), oversees compliance with ethical standards and data protection regulations. This committee provides guidelines on data management, privacy, and ethical considerations, particularly in activities involving human subjects.
    - The IEA plays a key role in advising on ethical implications and assessing adherence to ethical and legal standards, especially concerning AI, data handling, and workforce impact.
5. **External Advisory Board (EAB)**
    - Managed by UITP, the EAB consists of external experts who provide an independent perspective on the project's direction, ensuring it remains aligned with industry trends and best practices. The EAB offers advice on strategic decisions, identifies potential risks, and suggests improvements based on industry insights.
    - This board helps NEXUS to adapt to the evolving needs of the urban transport sector and ensures the project's outcomes are relevant and practical.
6. **Project Officer and Reviewers**

- The Project Officer, appointed by the EU-Rail, acts as the main point of contact between the NEXUS consortium and the Commission. The Project Officer monitors progress and provides feedback to ensure the project remains on track and adheres to its objectives.
- Reviewers, appointed by the EU-Rail, periodically assess NEXUS's progress and outcomes, providing critical evaluations that help guide the project towards successful completion.

This governance, showed in Figure 2, structure enables the NEXUS project to function efficiently, with clear roles and responsibilities that facilitate collaboration and ensure accountability across the consortium. The integration of advisory bodies and ethical oversight ensures that the project's outputs meet high standards in terms of impact, compliance, and societal relevance.

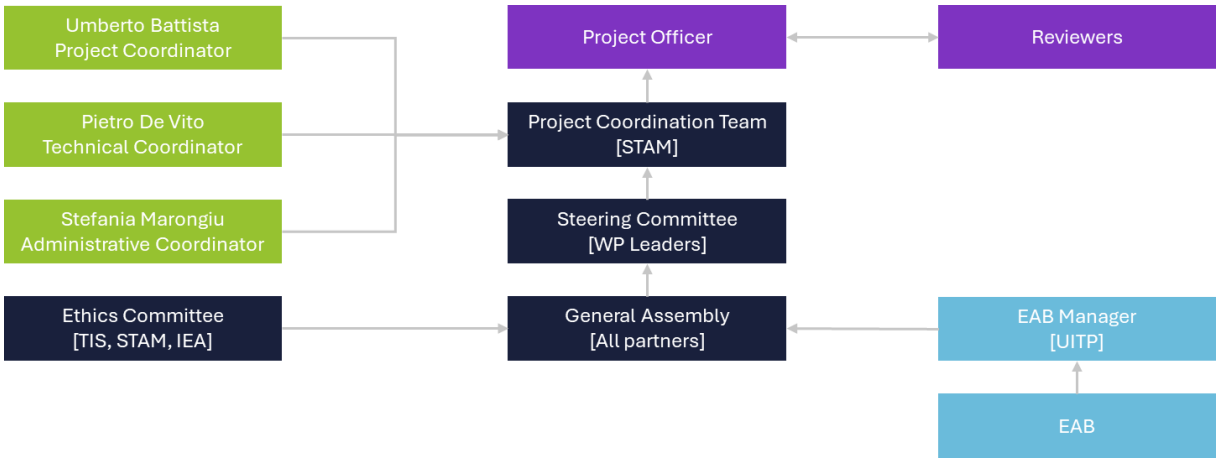

Figure 2 – NEXUS Management Structure

3 COMMUNICATION AND COLLABORATION

3.1 COMMUNICATION PROTOCOL

In any collaborative project, especially one as complex and ambitious as NEXUS, effective communication is essential. The communication protocols outlined here aim to establish clear, structured, and transparent methods for keeping all consortium partners informed, aligned, and empowered to contribute to the project's success. These protocols are crafted to ensure that decision-making is streamlined, that critical information reaches all relevant parties efficiently, and that project milestones are met collaboratively. They form the backbone of how NEXUS partners will work together, addressing both everyday communication needs and higher-level decision-making processes.

3.1.1 INTERNAL COMMUNICATION STRUCTURE

The NEXUS consortium has been organized to promote clear lines of responsibility, allowing each member to understand their role within the project. At the core of this structure are three key bodies, each with a distinct function:

- **The General Assembly (GA):** As the highest decision-making body, the GA is where major strategic decisions take place. It represents all consortium members, giving each partner a voice in the project's direction.
- **The Steering Committee (SC):** Overseeing the technical and scientific progress of the project, the SC acts as a bridge between the daily work and the long-term goals of NEXUS. Reporting to the GA, the SC ensures that the project's research and technical activities are advancing according to plan.
- **The Project Coordination Team:** Led by STAM, the Coordination Team manages day-to-day project operations. They play a crucial role in facilitating communication across the consortium, ensuring that updates, issues, and decisions are relayed to all partners promptly and accurately. Moreover, the Project Coordinator Team is responsible for communication with EU-Rail, particularly with the Project Officer. Biweekly online alignment meetings are scheduled between the Project Coordinator and the Project Officer to provide updates on the progress of the project's activities.

Each of these bodies has specific responsibilities to keep the project moving forward smoothly. This structure ensures that everyone knows where to turn for guidance, support, and decisions, fostering an organized and efficient work environment.

3.1.2 MEETING PROTOCOLS

Regular meetings are the backbone of NEXUS, providing a space for partners to discuss progress, tackle challenges, and make decisions. The NEXUS project follows a structured meeting schedule to ensure consistency and availability (summarized in Table 1):

- **General Assembly Meetings:** The GA meets periodically: twice a year physically and twice via online meetings. “Extraordinary meetings” are optional if significant issues arise. These meetings are pivotal for reviewing major milestones, discussing high-level progress, and addressing any critical issues.
- **Steering Committee Meetings:** The SC meets monthly to dive into the scientific and technical aspects of the project. These meetings are critical checkpoints for reviewing the project’s research advancements and troubleshooting technical challenges.

Table 1 – Consortium Agreement, art 5.1.2.1 Convening meetings

	ORDINARY MEETING	EXTRAORDINARY MEETING
General Assembly	At least twice a year	At any time upon request of the Scientific Committee or 1/3 of the Members of the General Assembly
Steering Committee	Quarterly	At any time upon request of any Member of the Scientific Committee

For each meeting, there are specific notice periods to ensure everyone has adequate time to prepare. GA meetings have a 45-day notice period, while extraordinary GA meetings require shorter notice – 15 days (as summarized in Table 2). The SC meetings have 14-day notice period, while extraordinary SC meetings require 7 days for the SC. By following these guidelines, we ensure that each meeting is well-prepared, productive, and that all members have ample opportunity to contribute.

Table 2 – Consortium Agreement, art 6.2.2.2 Notice of a meeting

	ORDINARY MEETING	EXTRAORDINARY MEETING
General Assembly	45 calendar days	15 calendar days
Steering Committee	14 calendar days	7 calendar days

Given the international scope of the consortium, many meetings are held virtually to facilitate attendance and reduce travel demands. These virtual meetings are conducted through video conferencing platforms, ensuring that distance does not hinder collaboration. For both virtual and in-person meetings, best practices are followed to ensure productive discussions, including guidelines on video and audio quality, time management, and member engagement. This approach enables all members to actively participate, regardless of location.

3.1.3 MEETING AGENDA AND MINUTES

To make the most of each meeting, we follow a structured approach to setting agendas. The Project Coordinator prepares and distributes the agenda ahead of time – 21 days for GA meetings and 7 days for SC meetings (as summarized in Table 3). This approach allows participants to review the topics and come prepared to discuss them in depth.

Table 3 – Consortium Agreement, art 6.2.2.3 Sending the agenda

EVENT	NOTICE PERIOD
General Assembly	21 calendar days, 10 calendar days for an extraordinary meeting
Scientific Committee	7 calendar days

Members are also encouraged to add items to the agenda, fostering a collaborative environment where any partner can raise issues or suggest topics. Additions must be submitted 14 days before GA meetings and 2 days before SC meetings. In special cases, items can be added during the meeting itself, provided all members agree. This flexibility allows us to address urgent issues while ensuring that meetings remain focused and efficient.

For every meeting, detailed minutes are taken to document discussions, decisions, and action items. The chairperson is responsible for preparing and sharing the minutes within 14 days after the meeting. Members then have 10 days to review and raise any objections. This system provides a formal record of all proceedings, ensuring that everyone is aligned and that there is a clear historical record for future reference.

Once accepted, the minutes are distributed to all partners and stored in the project's document repository, where they are accessible to everyone. This transparent approach ensures that all consortium members, whether present or absent, remain informed about project developments and decisions.

3.1.4 DECISION-MAKING PROCESSES

NEXUS follows a transparent decision-making process that respects the input of all consortium members. Each decision requires a quorum, meaning at least two-thirds of the body's members must be present or represented. If quorum is not met, the meeting is rescheduled to ensure that decisions reflect the collective input of the consortium.

When it comes to voting, each member has one vote, with decisions passed by a two-thirds majority. This approach balances inclusivity with efficiency, ensuring that decisions are made collaboratively but not delayed by procedural hurdles. If a partner feels that a decision might significantly impact their work, intellectual property, or other interests, they have the right to veto, triggering additional discussion to resolve the issue.

Despite best efforts, disagreements or conflicts may arise. The NEXUS communication protocols include a structured conflict resolution process, where issues are discussed within the relevant consortium body to find a mutually acceptable solution. If necessary, unresolved conflicts can be

escalated to the General Assembly for final deliberation. This process ensures that conflicts are addressed constructively, preserving a collaborative and respectful working environment.

3.1.5 EXTERNAL COMMUNICATION

The Project Coordinator, acting as the primary liaison, manages all official communication with the EU-Rail JU and the Granting Authority. This role includes overseeing compliance with reporting requirements and ensuring that the consortium fulfils its contractual obligations.

The NEXUS project also engages external stakeholders, including metro operators, experts, and end-users, through workshops, dissemination activities, and targeted communication. These efforts are designed to foster engagement, gather feedback, and ensure that project outcomes align with real-world needs in the transport sector.

3.2 NEXUS REPOSITORY

To ensure efficient project management and streamlined collaboration among all partners, a structured SharePoint folder system was established. This system organizes all project-related documents and materials in a way that is intuitive and easy to navigate. Below is an overview of the folder structure:

- **0. Proposal**
    - **Contents**: This folder contains all documents produced during the proposal phase. It includes working material, administrative information, budget details, and the full proposal documentation.
    - **Purpose**: To provide a comprehensive archive of all materials related to the project's initial proposal phase.
- **1. Official Documents**
    - **Contents**: This folder includes key contractual documents such as the Grant Agreement and the Consortium Agreement, as well as all deliverables in their final, submitted form.
    - **Purpose**: To store all officially binding documents and final deliverables, ensuring they are easily accessible for reference.
- **2. Technical Files**
    - **Contents**: This folder is dedicated to all technical files and materials produced throughout the project's lifecycle, organized by individual WPs (WPs) and tasks. Technical and financial documentation is collected in a structured folder tree divided per WP and Tasks.
    - **Responsibility**: Each WP and Task leader is responsible for maintaining and updating the contents relevant to their areas of responsibility.
    - **Purpose**: To keep all technical documents well-organized and easily retrievable, facilitating collaboration and progress tracking.

- **3. Meetings**
    - **Contents**: This folder houses all presentations and materials produced for General Assemblies and Review Meetings.
    - **Purpose**: To provide a central repository for all meeting-related documentation, ensuring all partners have access to the latest presentations and meeting records.
- **4. Templates**
    - **Contents**: This folder contains all templates to be used by partners when creating project documentation.
    - **Purpose**: To standardize the format and structure of project documents, ensuring consistency and professionalism across all outputs.
- **5. Contacts**
    - **Contents**: This folder collects the names of the partners involved in the project with their contact information.
    - **Purpose**: To ensure an effective communication between the partners, this list allows to give access to the contacts of the contact point of each consortium partner.

4 DELIVERABLE REVIEW PROCESS

4.1 PEER REVIEW PROCESS OVERVIEW

The aim of the review process is to ensure that all project deliverables meet high-quality standards, align with project objectives, and effectively communicate results to the target audience. For each deliverable, a primary reviewer will focus on assessing the content thoroughly, while a secondary reviewer will confirm the incorporation of comments and primarily perform proofreading. Both reviewers are chosen based on their expertise, involvement in the deliverable, and availability. The primary review stage should be completed within one week, followed by an additional week for the secondary review and finalization of comments.

The following questions serve as a structured guide for the review process. These questions are not exhaustive but help ensure each deliverable's quality, clarity, and compliance with project objectives.

Format and Presentation

- Is the deliverable formatted according to the project's template and guidelines?
- Is the text clear, well-organized, and free from major errors?
- Are images and graphics used appropriately to support the content?
- Are all references up-to-date and functional?

Content Quality

- Are there any major errors that could impact the interpretation of results?
- Are conclusions well-supported and based on realistic assumptions?
- Is the structure logical, and does it enhance comprehension?
- Have all relevant stakeholder comments been addressed?

Alignment with Project Objectives

- Does the deliverable achieve its objectives and fulfil the requirements of the Work Programme?
- Is the content suitable for the target audience, with clear identification of intended groups?
- Does the deliverable highlight any relevant technical innovations?

Supplementary Materials and Sources

- Is there adequate use of data, examples, and supplementary materials (e.g., tables, graphics)?
- Are all sources and references cited correctly and appropriately?

Final Remarks and Suggestions

- Does the deliverable include a concise conclusion that reflects its findings?
- Are there any additional comments or suggestions for improvement?

4.2 REVIEW CHECKLIST

Table 4 – Checklist for Leaders

Checklist for Leaders	Info	
Number of Deliverable		
Title of Deliverable		
Name of author(s) of Deliverable		
Partner name of the author's organisation		
Date of the draft version that has been Peer reviewed	1st review:	2nd review:
Submission deadline		

Table 5 – Checklist for Reviewers

Checklist for Reviewers	1st Review	2nd Review
Name of the Peer Reviewer		
Partner name of the peer reviewer's organisation		
Date of completion of the checklist		
Tables and other figures numbered correctly (use of headlines, number of all figures)		
Use of deliverable template		
Correct numbering of chapters and subheadings		
Reference to IEE funding (legal disclaimer where appropriate, IEE logo)		

4.3 DELIVERABLE REVIEW TIMELINE

To maintain a structured and timely review process, each deliverable will follow the timeline below:

1. Three Weeks Before the Deadline:
    - Draft Submission: The responsible partner submits the draft deliverable to the primary reviewer.
2. Two Weeks for Review and Feedback:
    - Primary Review (First Week): The primary reviewer thoroughly assesses the draft, addressing content quality, alignment with project objectives, and format requirements. Comments and feedback are provided to the lead partner. The primary reviewer has to complete a review summary form to document the main points of the review.
    - Secondary Review (Second Week): After the primary reviewer's feedback is addressed, the secondary reviewer confirms that changes have been incorporated and performs final proofreading. The secondary reviewer also completes a review summary form to document the main points of the review.
3. Final Submission (Last Week):
    - Finalization and Submission: The lead partner finalizes the deliverable by incorporating all comments and submits it by the deadline.

Each reviewer will review the deliverable sequentially, not concurrently, to ensure that feedback from the primary review is addressed before the secondary review begins.

4.4 LIST OF REVIEWERS

The following Table 6 report the list of deliverables with the main author, the WP and delivery date. In addition, to each deliverable is associated also two dedicated reviewers.

Table 6 – List of Reviewers

Number	Deliverable name	WP n.	Leader	Reviewer n.1	Reviewer n.2	Delivery date
D1.1	Project Management – Handbook 1st Release	WP1	STAM	AU	PT	M06
D1.2	Data Management Plan – 1st Release	WP1	TIS	TUW	ERTICO	M03
D2.1	Project Management – Handbook 2nd Release	WP2	STAM	UITP	VIF	M24
D2.2	Data Management Plan – 2nd Release	WP2	TIS	UNIGE	PT	M24
D3.1	User & operator requirements and framework conditions	WP3	TUW	AMT	MetroS	M08

Number	Deliverable name	WP n.	Leader	Reviewer n.1	Reviewer n.2	Delivery date
D4.1	Metro transport system models development	WP4	AU	UITP	VTU	M12
D4.2	Comprehensive Metro System Optimization Report	WP4	UNIGE	VIF	PT	M12
D5.1	Future Control Systems: Requirements, Framework and Benefits	WP5	SIEM	UNIGE	UITP	M12
D6.1	AI in future metro operations	WP6	VIF	VTU	TIS	M08
D6.2	AI demonstrators	WP6	VIF	TUW	UITP	M12
D6.3	Cybersecurity threat identification and management	WP6	PT	UITP	STAM	M12
D7.1	Validation and exploitation of metro system simulation models and AI- Applications	WP7	AU	TUW	VTU	M18
D7.2	Validation and exploitation of approaches for optimising and flexing decision making and metro system management	WP7	UNIGE	SIEM	VIF	M24
D8.1	NEXUS Guidelines Report	WP8	STAM	AMT	VTU	M23
D8.2	Acceleration Support Report	WP8	TIS	AU	UNIGE	M24
D9.1	Stakeholder engagement and dissemination strategy	WP9	ERTICO	SIEM	UITP	M04
D9.2	Stakeholder engagement and dissemination activities report – Year 1	WP9	ERTICO	AMT	STAM	M12
D9.3	Preliminary exploitation plan and road mapping	WP9	TIS	VTU	UITP	M12
D10.1	Updated stakeholder engagement and dissemination strategy	WP10	ERTICO	AMT	SIEM	M13
D10.2	Stakeholder engagement and dissemination activities report – Year 2	WP10	ERTICO	VTU	TUW	M24

Number	Deliverable name	WP n.	Leader	Reviewer n.1	Reviewer n.2	Delivery date
D10.3	Exploitation plan and road mapping	WP10	TIS	UITP	SIEM	M24

5 RISK MANAGEMENT STRATEGY

The Table 7 outlines the potential risks identified for the NEXUS project, highlighting both internal and external factors that could impact the project's successful execution. The Table 7 specifies which WPs are affected, along with the likelihood and severity of each risk, and provides detailed mitigation measures to address and minimize these risks.

NEXUS is a complex project that involves multiple partners, workstreams, and stakeholders across Europe, and thus demands a proactive and structured risk management approach. To ensure project continuity and the achievement of project objectives, several risk categories have been identified, ranging from participant commitment, data quality, and technical challenges, to external risks and stakeholder engagement.

Each risk is assigned a "Likelihood" and "Severity" rating, helping prioritize the response and management focus. Mitigation strategies include comprehensive planning, regular check-ups, effective communication, contingency measures, and a flexible project management approach. Through these structured measures, the NEXUS consortium aims to maintain project integrity, ensuring that deliverables are met on schedule and with high quality, while remaining responsive to unforeseen challenges.

Table 7 – Risk Matrix

DESCRIPTION OF RISK	WP(S)	RISK-MITIGATION MEASURES	LIKELIHOOD / SEVERITY
Weak commitment of participants to the project plan and deadlines. Potential for serious delays as lack of progress in one or more tasks may cause delays for linked or subsequent tasks, and hence for the project as a whole.	All	Regular internal check-ups and reports about the development in each WP. At the beginning of each task a detailed plan will be prepared and agreed with clear responsibilities allocated to all participants. Progress of on-going task will be monitored, and issues managed via monthly reports from task leaders. Evolving deliverables will be followed based on project internal review process to identify possible problems well in advance of deadlines. The quality of project outputs is ensured and overseen by the Project Coordinator in accordance with the Project Management – Handbook (D1.1 and D2.1).	Low / Medium.
Unclear roles and responsibilities between participants.	All	Defined in Consortium Agreement (CA), Grant Agreement (GA); effective communication.	Low / Medium
External risks: global and/or European level force majeure situations (e.g., pandemic and/or continuation/ spreading of Ukraine war).	All	Project Coordinator will monitor the situation and possible implications to the project and follow guidance of local and European authorities. Project Coordinator will discuss actively with EU-Rail Programme Officer (PO) and communicate any possible changes in the project implementation to the consortium preparing amendment of Grant Agreement if necessary	Low / Medium
Inadequate or poor-quality data can impact the technical activities and the reliability of NEXUS results.	WP3, WP4,	Redundance of use cases and/or the collection of secondary data, publicly available data sets and reports will prevent this risk.	Low / High

DESCRIPTION OF RISK	WP(S)	RISK-MITIGATION MEASURES	LIKELIHOOD / SEVERITY
	WP5, WP6		
Technological Challenges due to technical and compatibility issues between different tools.	WP4, WP5, WP6, WP7, WP8	The partners involved in WP3 have already had several collaborations in the past. The activities of WP5 and WP6 start from a very low TRL, so solutions will be identified that best meet the objectives and duration of NEXUS.	Low / High
Lack of effective collaboration and communication among project partners and external stakeholders.	WP3, WP4, WP5, WP6, WP7, WP8	The implementation of an effective project management based on several coordination meetings among WP Leaders and effective dissemination and communication plan will allow to involve actively internal and external stakeholders	Low / Medium
Poor scalability of the solution to European metro and transport operators.	WP4, WP5, WP6, WP8	The NEXUS consortium has international experience in the transport sector. The presence of several European use cases and the intention to involve external stakeholders (both metro operators and passenger representatives) is proof of the willingness to develop standardised solutions based on common requirements. The CBA can serve as sound evidence of how transfer-worthy the solutions can be.	Low / Medium

DESCRIPTION OF RISK	WP(S)	RISK-MITIGATION MEASURES	LIKELIHOOD / SEVERITY
Low commitment / lack of engagement of different stakeholders to the dissemination workshops and other events.	WP3, WP9, WP10	NEXUS puts in place a solid dissemination strategy involving the planning and scheduling of events and dates in advance, as well as the exploitation of the extensive networks of partners from various disciplines	Low / Medium
Insufficient data can impact the accuracy of the Cost-Benefit Analysis.	WP8	NEXUS follows the triangulation principle, ensuring that all the partners conduct a comprehensive and diverse data collection processes. Identified data gaps will be covered by both stakeholder consultation and literature sources to find plausible parameters.	Low / Medium
External factors (e.g. regulatory changes or technologic shifts) affecting the Cost-Benefit Analysis and hinders the acceleration of prototypes.	WP8	NEXUS regularly updates its risk management plan as it will establish a system for monitoring external factors that can impact the project.	Low / Medium
Metro operators' resistance to change might hinder the acceleration of prototype readiness levels.	WP8	NEXUS works directly with metro operators and provide support and guidance to ensure that solutions identified continues beyond NEXUS lifespan. The partners will establish clear communication channels to ensure this after the conclusion of the project.	Low / High

6 REPORT

On behalf of the project consortium, the Project Coordinator submits all reports, payment requests, proof of deliverables and other documents through the grant management service. Each partner can access the service through its profiles in the Funding & Tenders Portal.

There are two types of reporting in the Grant Management Services in the Funding & Tenders Portal:

- Continuous Reporting: available from the beginning of a project.
- Periodic Reporting: available at the end of a reporting period.

Reporting periods are always linked to a payment and, in the NEXUS project, content will only concern technical reporting.

6.1 CONTINUOUS REPORTING

During the project, the consortium has to provide regular updates on the status of the project: the continuous reporting.

The continuous reporting includes:

- Progress in achieving milestones.
- Deliverables.
- Updates to the publishable summary.
- Response to critical risks, publications, communications activities, IPRs.
- Programme-specific monitoring information (if required).

The Continuous Reporting Module is accessible through the EC online portal.

The Continuous Reporting Module also allows the consortium to report on critical risks, prepare the summary for publication and the programme-specific information on indicators (e.g. Trainings, Gender, Open Data, etc.)

> Milestones — Control points in the project that help to chart progress (kick-off meetings, steering committees, first-draft of a survey, prototype, etc.) They may correspond to the completion of a key deliverable, which allows the next phase of the work to begin or is needed at intermediary points.
>
> Deliverables — Outputs to be submitted to the EU (publication, leaflet, progress report, brochure, list, etc.).

All this information is automatically compiled to create part A of the periodic Technical Report, at the moment this report is prepared.

6.2 PERIODIC REPORTING

The Periodic Report/Final Report is the pre-condition for receiving payments; it must be submitted through the EU Funding & Tenders Portal Grant Management System by the Project Coordinator within 60 days after the end of the reporting period.

In NEXUS project the UK partner ASTON is covered through the UK's association, and it is reported following its national laws.

6.2.1 REPORT COMPOSITION

The Report is composed of 3 parts:

1. Technical Part.
2. Status of WPs.
3. Financial Statement.

The Technical Part includes 2 sections:

- Part A, which has to be completed directly on the Funding & Tender portal.
- Part B, which has to be uploaded on the Funding & Tender portal.

6.2.2 TECHNICAL PART

The Technical Report consists of 2 parts:

- Part A contains structured tables with project information
- Part B is a narrative description of the work carried out during the reporting period. Part A is generated by the IT system. It is based on the information entered in the Portal Continuous and Periodic Reporting modules. Part B needs to be uploaded as PDF on the Technical Report (Part B) screen. The template to use is fixed by the EC.

6.2.3 STATUS OF WPS

At the final period, the Project Coordinator is able to mark the status as "completed", "not completed" or "partially completed". If the WP is "partially completed", the coordinator has to indicate a percentage of completion.

The percentage of completion corresponds to the share of activities carried out. It does not correspond to the share of objectives achieved (i.e. it is independent of a positive or negative outcome of the work).

Ethics and Security WPs should be completed in the final report. If they are completed before, a warning icon will appear next to the completed status and the system will display an error message when the session is validated.

A WP should be declared as completed when the work has been carried out as described in the description of action (Annex 1 of GA). It can also be declared as completed if some elements are missing, as long as all essential tasks have been completed, and/or equivalent tasks have been carried out, and/or when deviations have been duly justified.

At the end of the last reporting period, a WP as partially completed can be declared. WPs are partially completed if essential parts have not been carried out and not been replaced with equivalent work. In this case, the percentage of completion declared should correspond to the share of activities that have been carried out.

The percentage of completion declared corresponds to the percentage of payment requested. The payment for the WP concerned will correspond to the percentage of completion accepted by the granting authority.

6.2.4 FINANCIAL STATEMENT

After confirming the completion of the Status of WPs and including it in the Reporting package, the system will automatically generate for the Project Coordinator one Financial Statement for all beneficiaries and send a notification to the Project Coordinator announcing that the Financial Statement can be now signed. If needed, the Financial Statement can be corrected but this can be done only after the Status of WPs is also redone.

6.2.5 REPORT PROCESS

Once the elements of the Periodic Report are reviewed, the Periodic Report can be submitted to the EU-Rail. The Technical Part, the Status of WPs and the Financial Statement of the Periodic Report are submitted to the EC in one single submission.

After that the EU-Rail reviews the submitted Periodic Report and accepts, requests additional information or rejects it.

The EU-Rail can accept the report and start preparing the interim payment or the EU-Rail can request additional information in order to accept the Periodic Report. In this case the consortium via the Project Coordinator should read the request letter and upload the document containing the requested information.

The EU-Rail can also ask for a revision of the Report, this means that the process described above starts again.

6.2.6 BUDGET FLEXIBILITY

The partners can use the lump sum flexibly, in the best possible way for the project, because there is no reporting on actual costs.

For big changes in the budget, it might be in the interest of the consortium to make an amendment to change the breakdown of the lump sum shares, aligning it with the actual implementation of the project.

Lump sum grants provide very high budget flexibility because the consortium can use the budget as they see fit as long as the project is implemented as agreed. The actual use of the lump sum is invisible to the EU-Rail.

Budget transfers between beneficiaries and/or between WPs require an amendment if the consortium wants to have these changes in the grant agreement

In case the project officer rejects a WP, the consortium will not automatically lose the funding for the whole WP. Instead, the consortium has time to complete the WP until the end of the project. Amending the WP can help the consortium complete it. If a WP cannot be accepted at the end of the project, this

will likely lead to a partial payment in line with the degree of completion, not a rejection of the full amount for that WP. The partial payment will be determined in a formal grant reduction procedure, probably with the help of outside experts, and will include an adversarial process in which different points of view will be evaluated and compared.

7 CONCLUSIONS

The NEXUS project represents an ambitious initiative aimed at advancing the urban transportation sector, specifically metro systems, through innovative approaches that leverage AI, optimization and simulation models, and collaborative research. This initial release of the Handbook outlines the foundation for successful project governance, efficient communication, quality assurance, and risk management strategies that will guide the project throughout its lifecycle.

The governance and management structures established in this document serve to streamline decision-making and coordination among all partners. By clearly defining roles, responsibilities, and reporting lines, the Handbook ensures that each consortium member understands their part in advancing the project's objectives. The introduction of dedicated bodies such as the Project Coordination Team, Steering Committee, General Assembly, and Ethics Committee provides a robust framework for oversight and accountability. These structures facilitate collaboration, maintain ethical compliance, and ensure alignment with both the EC expectations and NEXUS's strategic goals.

Effective communication protocols have also been outlined to foster transparency and unity within the consortium. The Handbook establishes standardized communication channels, internal meeting protocols, and structured decision-making processes to support a cohesive working environment. Additionally, guidelines for external communication ensure that all interactions with the EU-Rail, stakeholders, and the public are managed in a consistent, professional manner, safeguarding the project's reputation and aligning with its dissemination goals.

The quality management and peer review processes are designed to uphold high standards in deliverable production, ensuring that each output is meticulously reviewed and aligned with project objectives. The use of a structured repository for documentation further enhances accessibility, organization, and transparency across the consortium. These measures contribute to the credibility, reliability, and impact of NEXUS's findings and deliverables, positioning the project as a benchmark in the field of smart urban transportation.

Risk management remains an integral part of the project's approach to achieving successful outcomes. By proactively identifying potential risks and implementing comprehensive mitigation strategies, NEXUS demonstrates a commitment to adaptability and resilience. This strategy addresses both internal challenges, such as resource allocation and technical dependencies, and external uncertainties, including regulatory shifts and stakeholder engagement dynamics.

As the project progresses, the Handbook will continue to evolve, adapting to new insights and requirements. Updates to this document will reflect any necessary adjustments to governance, communication, quality control, and risk management processes to support ongoing improvements. Through this iterative approach, the NEXUS consortium remains responsive to the challenges and opportunities of a rapidly changing urban mobility landscape.

The procedures and processes outlined in this first release of the Handbook lay a solid foundation for NEXUS's success. By ensuring clear communication, rigorous quality management, robust risk mitigation, and strong ethical oversight, the consortium is well-positioned to make meaningful contributions to the future of metro systems and urban transportation. This comprehensive approach to

project management not only supports the efficient execution of NEXUS but also maximizes its potential for long-term impact and innovation in the field of sustainable urban mobility.