

PivotBuoy

***An Advanced System for Cost-effective and Reliable Mooring,
Connection, Installation & Operation of Floating Wind***

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D1.2: Initial Project Risk Management Plan

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the consortium (including Commission Services)	
CO	Confidential, only for members of the consortium (including Commission Services)	



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EXECUTIVE SUMMARY

The Initial Project Risk Management Plan of PivotBuoy provides a high-level plan that aims at guiding, the consortium in general and Risk Management responsables in particular, on the management of all project's risks.

It is provided a framework that addresses responsibilities, the risk assessment process including identification, classification (quantification & qualification) and monitoring including the mitigation and contingency plan. This initial Project Risk Management Plan shall guide the consortium in all the project risk analysis, which will then report all the risks in the risk register presented in Annex A – Risk Register.

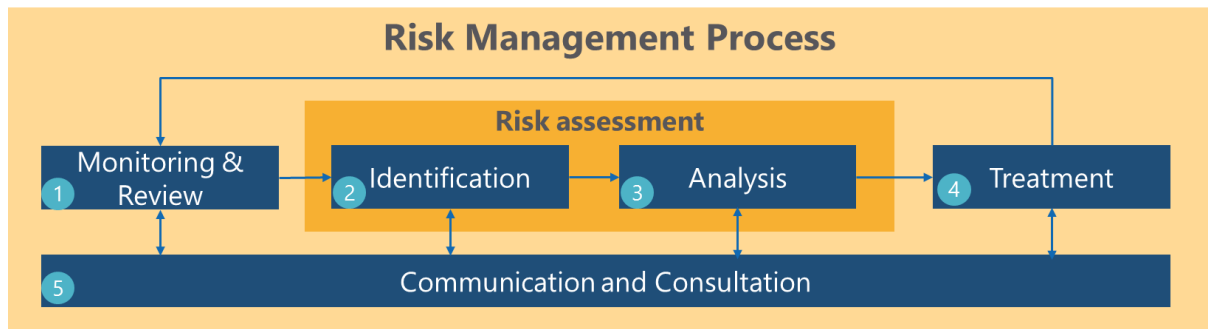


Figure 0-1: Risk Management Process

This report will be updated in month 14 (May of 2020) in Deliverable 1.4 according to the evolution of the project.

1 INTRODUCTION

1.1 Purposes and Scope of Deliverable

This report provides a description of the several actions defined inside the consortium to properly manage the project risks.

Section 2 states the internal structure for the Risk Management Process of the project and the different responsibilities provided to the partners in order to enhance the potential of their contribution.

Section 3 presents the flow diagram for Risk Management Process and details the goals and specifications of each phase of the project risk assessment.

The risk classification methodology taking into account the different types of risk, its probability and impact is described in Section 4

Section 5 describes the internal procedures that lead to the definition of Mitigation and Contingency actions.

In Section 6, a preliminary calendar is defined for the execution of risk assessment activities that assess the tasks which risks may present the biggest hazards, related to Project Management, Design, Engineering and Operation.

1.2 References

1.2.1 Internal documents

1. PivotBuoy Deliverable D1.1 – Initial Project Management Plan, May 2018

1.3 Acronyms

Table 1-1: Acronyms

FMECA	Failure Modes, Effects and Criticality Analysis
HAZID	Hazard Identification
HAZOP	Hazard and Operability study
HSE	Health, Safety and Environment
PMT	Project Management Team
WP	Work Package

2 RESPONSIBILITIES

As referred in [1], the level of complexity of the PivotBuoy project with design, manufacturing and installation of a prototype offshore in a short period of time, requires a permanent coordination, throughout the project, that will constantly deal with risk identification, plan and implementation of responses and/or contingency measures.

This deliverable aims for the development of an initial risk management plan (non-technical related risks) with the methodology for risk identification, qualification, quantification and response in order to ensure a proper strategy to respond and mitigate the identified risks.

The project Risk Management is divided into four different tasks in WP1 and WP6, namely T1.4, T6.1, T6.2 and T6.3, being closely linked to the different types of risks. This document focuses on aligning and coordinating the actions of the different risks tasks, assigning different responsibilities to different members to ensure the mitigation of interface problems that may arise from a non-centralized risk assessment. The different responsibilities and ownership of each task are identified in Figure 2-1.

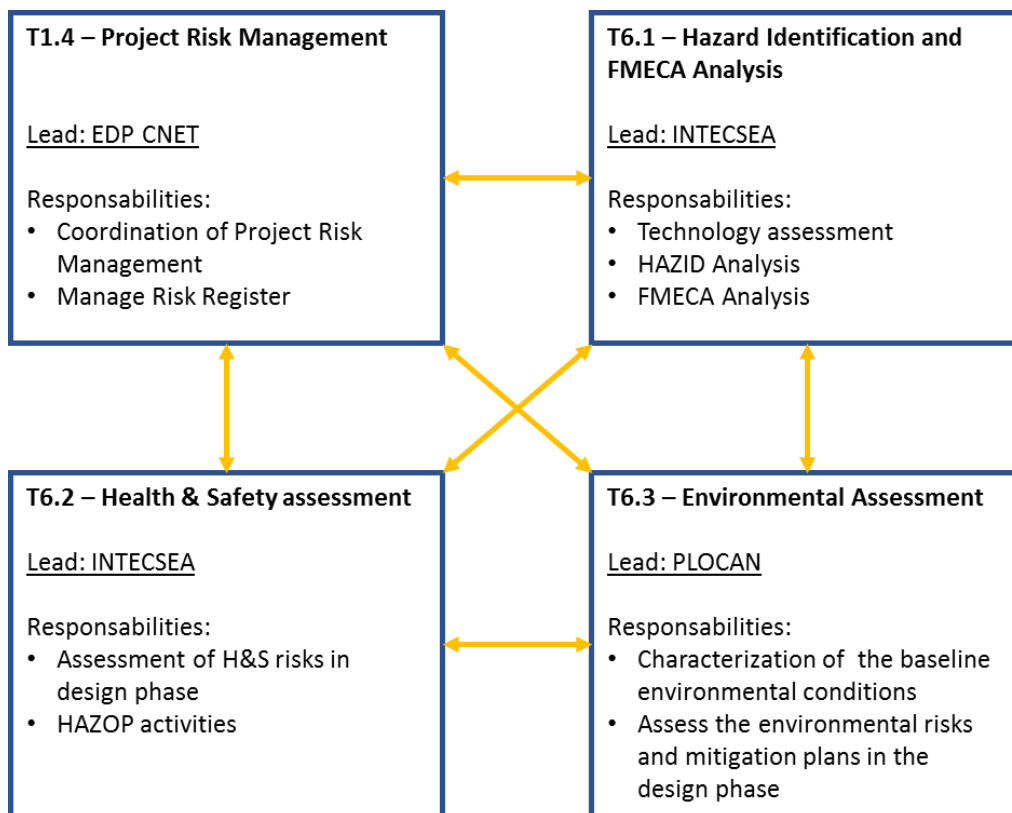


Figure 2-1: Risk Management Roles and Responsibilities

Each abovementioned leader is responsible for their internal risk activities and should incorporate any partner that participates in the activities inside the scope of the assessment. In order to ensure the correct tracking of risks of each category, its accountability and ease of communication each task identified in Figure 2-1 has an assigned leader, presented in Table 2-1, to act as a focal point for risk management topics.

Table 2-1: Risk focal point

Partner	Responsible
EDP CNET	Filipe Guerra
INTECSEA	Henk van der Burg
PLOCAN	Javier González

Every Task leader of the project is responsible for identifying and reporting its tasks' risks to the above-mentioned responsible persons for follow-up with management.

Apart from the specific internal groups risk evaluations conducted by each task leader to ensure the Risk Management Plan stated in this document is followed, there is a Consortium body, the Steering Committee, responsible for the strategic and managerial decisions and will recommend adjustments to the work programme when needed, reassess project objectives where appropriate, monitor the quality of the project outputs, review technical progress on tasks.

3 RISK MANAGEMENT PROCESS

Risk Management is a crucial component of Project Management, and comprises processes of Identification, Analysis, Estimation and Treatment of risks. Overall, the main objective of Risk Management is to increase the likelihood and impact of positive events and reduce the likelihood and impact of negative events. The risk management process is an integral part of project management and is designed to identify risk for the various activities during the project lifetime. The risk management process consists of a set of activities, as it can be seen in Figure 3-1, enabling risks to be assessed, communicated and treated appropriately throughout the whole project. The process established in Figure 3-1 will be repeated in the various work packages and phases of the project. The risk workshops and activities will be initiated according to Risk Management Timeline, Section 6, or when found necessary by the Project Management Team (PMT).



Figure 3-1: Risk Management Process

As described in Figure 3-1, the risk management process comprises 5 steps, namely:

- 1) **Monitoring and Review** - Risk monitoring activities implement the risk monitoring strategy by gathering information, alerting or reporting on information relevant to intended purposes for risk monitoring, and providing inputs to ongoing risk assessment and response processes. This includes verifying compliance with the risk response decisions by ensuring the consortium (or involved partners) implements the risk response measures, determines the ongoing effectiveness of risk response measures, and identifies any changes that would impact the risk posture depending on risk assumptions, constraints, priorities, and tolerance levels, the set of risk monitoring practices actually implemented may differ from what is documented in the risk monitoring strategy. Risk monitoring activities at the various levels should be coordinated and communicated (phase 5). This can include sharing risk assessment results that would have impact to risk responses being planned or implemented.
- 2) **Identification** - The main objective of this stage is to search and identify risk that may exist. To keep the process manageable the context boundary of the overall risk analysis will be described. Basically, this defines for whom the analysis is being done (e.g., the project manager, the supervisor, or the welder) and what issues are in his or her area of responsibility. To aid in the perspective and context boundary definition, it is usual practice to make a complete list of the project objectives, assumptions, expectations, and constraints, and then to check these for reasonableness. If the objectives are unreasonable, not even then the most

thorough risk management process will be helpful. Similarly, if the assumptions are incorrect, the project likelihood of success will be drastically reduced. In practice, the project risk referential changes over time, being typically goal setting in the project beginning, and becoming prescriptive as the project proceeds. Identifying measurable risks is the most critical activity to perform.

- 3) Analysis - Working with the information gathered during risk identification, partners (and risk owners) can begin the analysis of the risk levels of the identified hazards and prioritize actions based on existing controls, among other criteria. Risk analysis involves a detailed consideration of uncertainties, hazards, consequences, likelihood, events, scenarios, controls and their effectiveness. From there, decision makers can then analyse each risk to determine the highest-level risks to address.
- 4) Treatment – The risk treatment process consists of selecting and applying the most appropriate risk mitigation measures, in order to modify the risk, with the aim of avoiding the damages intrinsic to the risk factor or make use of the advantage of the mitigating measures.
- 5) Communication and Consultation - Risk communication plays a key role in helping the consortium (or involved stakeholders) applying the concepts of risk management in their operations. It is critical to the success of the project especially when it comes to external relations. The main purpose of communicating risks is to inform people about the potential hazards related to a particular condition or activity.

The risk management techniques envisaged in the project are:

1. **Technology Readiness Level (TRL)** assessment – The TRL assessment evaluates the techniques employed in the project by analysing the knowledge level about an application and the technology status. These define a Technology class with related ranking of the challenge for the project and expectation for qualification.
2. **HAZID** – The Hazard Identification (HAZID) study is a technique for early identification of hazards and threats that can be applied at the conceptual or detailed design stage. Early identification and assessment of hazards provides essential input to timely project development decisions to minimize cost impact for a change of design. A HAZID study is carried out by an experienced multi-discipline team using a structured approach based on a checklist of potential hazards. The findings and hazard ratings help to deliver HSE compliance and form part of the project Risk Register required by many licensing authorities. To be led by INTECSEA during T6.1.
3. **HAZOP** - A hazard and operability (HAZOP) study is a design review technique used for hazard identification, and for the identification of design deficiencies which may give rise to operability problems. HAZOP is most commonly applied to systems which transfer or process hazardous substances or activities where the operations involved can be hazardous and the consequences of failure to control hazards may be significant in terms of damage to life, the environment or property. To be led by INTECSEA during T6.2.

4. **FMECA** - Failure Modes, Effects and Criticality Analysis (FMECA) is a methodologies designed to identify potential failure modes for a product or process, to assess the risk associated with those failure modes, to rank the issues in terms of importance and to identify and assign corrective actions to address the concerns. To be led by INTECSEA during T6.1.

As referred in [1], risk management activities will be recorded in a Risk Register, hosted by the project Intranet. EDP CNET will review and update the Risk Register in coordination with X1 Wind as part of their activities within project control. A Risk Register is a tool for documenting risks, and actions to manage each risk. The Risk Register is essential to the successful management of risk. When risks are identified they are logged in the register and actions are taken to respond to the risk. The risk register (that can be found in Annex A – Risk Register) contains fields to fulfil the risk management process above mentioned.

4 RISK CLASSIFICATION

The classification of all risks in the project Risk Register is an essential step to prioritize the effort of the consortium into acting upon the most relevant risks at a certain moment. In this case, the risk relevance can be estimated by using its predicted impact in different areas of interest that are considered essential to the project success.

The areas for evaluation of the project are:

- Project Risk - Led by EDP in task T4.1
- Business Risk - Led by EDP in task T4.1
- TRL, HAZID and FMECA – Led by INTECSEA in task T6.1
- HS&E Risk – Led by INTECSEA and PLOCAN in tasks T6.2 and T6.3 respectively

Each of these areas can be characterized by a group of well-suited indicators (the indicators can be consulted in the Risk Register available in Annex A – Risk Register) that have to be monitored in order to understand the evolution of how critical the risk is. The separated evaluation in different areas of interest allows a better insight into the risk possible impact and a better understanding regarding which partner is more suitable to perform mitigation actions.

The criteria used to classify each risk of PivotBuoy project are aligned with usual practice in the Offshore Wind industry and can be consulted from Table 4-3 to Table 4-3.

Table 4-1 presents the Project Risk Classification which is divided in 5 main categories: Cost, Schedule, Scope, Quality and Operation. The quantification in the Cost and Schedule categories presents a first assessment of the project requirements for the initial risk assessment of all critical tasks.

Table 4-1: Project Risk Classification

		Project risk				
		Cost	Schedule	Scope	Quality	Operation
Impact	Very High (80-100%)	>150 k€ increase	>120 days increase	Project and item is effectively useless	Project end item is effectively useless	Major operational accident
	High (60-80%)	100 -150 k€ increase	20-120 days increase	Scope reduction unacceptable to client	Quality reduction unacceptable to client	Significant Operational accident
	Medium (20-60%)	50-100 k€ increase	10-20 days increase	Major areas of scope affected, client approval	Quality reduction requires client approval	Irreversible operational failure
	Low (5-20%)	10- 50 k€ increase	5-10 days increase	Minor areas of scope affected, client awareness	Minor quality reduction - client awareness	Operational failure
	Very Low (0-5%)	< 10 k€ increase	0-5 days increase	Scope decrease barely noticeable	Quality degradation barely noticeable	Minor (non-critical) operational impact

Table 4-2 presents the Business Risk Classification which is divided in 4 main categories: Reputation, Finance, Uptime and Assets. This Risk type is more related to consortium partners internal risks regarding the execution of PivotBuoy. Nevertheless, any internal problems or risks may/will have repercussions in the project so these risks shall be thoroughly assessed and registered.

Table 4-2 - Business Risk Classification

		Business risk			
		Reputation	Finance	Uptime	Assets
Impact	Very High (80-100%)	International media or political attention	Major impact on corporate finances	Production Shutdown lasting > 1 month	Major damage to critical assets
	High (60-80%)	National media or political attention	Major impact on business unit finances	Production Shutdown lasting 1 – 4 weeks	Irreversible damage to critical assets
	Medium (20-60%)	Local media or political attention	Impact on business unit finances	Production Shutdown lasting 1 day – 1 week	Damage to critical assets
	Low (5-20%)	Impact on customer relation	Minor impact on business unit finances	Production Shutdown lasting < 1 day	Damage to assets
	Very Low (0-5%)	Minor impact on customer relation	Limited impact on finances	Shutdown with immediate startup	Minor damage to assets

Finally, Table 4-3 presents the Health, Safety and Environment Risk Classification which will present a critical assessment due to the operational and real environment demonstration nature of PivotBuoy.

Table 4-3: HS&E Risk Classification

		HS&E Risk		
		Health	Safety	Environment
Impact	Very High (80-100%)	Permanent health injury	Serious injuries or death(s)	Major damage to environment in large area and multiple species of fauna/flora
	High (60-80%)	Long term health injury	Permanent injury	Large damage to environment in large area and multiple species of fauna/flora
	Medium (20-60%)	Temporary health injury requiring sick leave	Absence or medical treatment injury	Damage to environment in small area or multiple species- report required
	Low (5-20%)	Temporary health injury requiring medical attention	First aid injury	Minor damage to environment in small area or single species of fauna/flora
	Very Low (0-5%)	Minor health injury that could develop by sustained exposure	Minor injury not requiring first aid	Insignificant damage to environment in small area or single species of fauna/flora

Regarding the environmental risk classification, the environmental impact assessment will be conducted according to the EU regulations, as well as National and Regional legislation. According to the Spanish legislation, the environmental impacts are classified in 4 classes: compatible, moderate, severe or critical. In order to fit both methodologies, the partners involved in the global risk assessment will study in detail the best solution to conduct the environmental risk analysis taking into account the guidelines provided by the Spanish authorities. Table 4-4 presents the Risk Level which is categorized by colours and numbers according to the risk probability and impact. The risks are categorized from 1 to 25, presenting the probability and impact. The colours categorization is according to the following classification:

- Green – Low
- Yellow – Medium
- Orange – High
- Red – Very High

Table 4-4: Risk level

		Probability (annual likelihood / frequency)				
		Improbable (0-5 %)	Unlikely (5-20%)	Neutral (20-60%)	Likely (60-80%)	Probable (80-100%)
Impact	Very high (80-100%)	15	19	22	24	25
	High (60-80%)	10	14	18	21	23
	Medium (20-60%)	6	9	13	17	20
	Low (5-20%)	3	5	8	12	16
	Very low (0-5%)	1	2	4	7	11

A High or Very High Risk shall be directly communicated to the Risk Register Manager (EDP CNET) and Project Coordinator (X1 Wind) as soon as it is classified as so.

5 MITIGATION AND CONTINGENCY

The implementation of mitigation measures is key when design, engineering, operations or project management teams are in the process to reduce the risks as much as reasonably practicable to acceptable values before the implementation of any task.

Mitigation procedures are defined to reduce the impact and/or probability or both of a certain risk and might have impact on the budget and schedule of the project, or other categories mentioned from Table 4-1 to Table 4-3. The potential cost associated to a mitigation procedure can be seen as an “insurance” in order to reduce the probability/impact or prevent even bigger and maybe critical losses for the project. Risk mitigation handling options include:

- **Eliminate:** Implement a change to eliminate the risk
- **Assume/Accept:** Acknowledge the existence of a particular risk and make a deliberate decision to accept it without engaging in special efforts to control it. Approval of project or program leaders is required.
- **Avoid:** Adjust program requirements or constraints to eliminate or reduce the risk. This adjustment could be accommodated by a change in funding, schedule, or technical requirements.
- **Control:** Implement actions to minimize the impact or likelihood of the risk.
- **Transfer:** Reassign organizational accountability, responsibility, and authority to another stakeholder willing to accept the risk.
- **Watch/Monitor:** Monitor the environment for changes that affect the nature and/or the impact of the risk.

As it can be perceived in Annex A, each Risk identified in the project has a responsible for providing the first assessment in terms of probability, impact and possible mitigation measures. The risk might impact on several areas of the project and therefore its mitigation actions need to be discussed with the remaining partners involved in those actions. The procedure for implementing mitigation actions with impact on the budget or schedule of any partners should go through several phases:

- **Definition of Mitigation Actions by Risk Owner** - The Risk owner is the partner or person responsible for the task in which the risk exists. Therefore, this owner is responsible for thoroughly evaluate the possible consequences of the risk, including probability of occurrence and possible impact. The proposed mitigation measures should be included in the risk register as well as any remaining information required. If the mitigation actions imply any change in the scope of work, budget or schedule, they should be discussed and approved in the following Risk Workshop.
- **Risk Workshop** - The Risk Workshops are physical meetings or video-conferences held exclusively to discuss and revise the status of previously identified risks, updates on the Risk Register and define mitigation actions for the new risks. The participation of consortium partners in the workshops shall take into account the risk type (Project, Business, HS&E) under evaluation. The presence and participation of risk responsible persons (X1 Wind, EDP CNET, INTECSEA and PLOCAN) shall be mandatory.
- **Implementation of Mitigation Actions** - The actions agreed and defined in the risk workshops will be assigned to one or more specific partners with a certain schedule. The risk owners shall guarantee that it is performed within the proposed schedule or inform the Risk Register Manager of any unexpected constrain.



- Review of Risk – As part of the Monitoring and review stage, after implementation of mitigation measures, there should be a re-evaluation of probability and impact by the owner of the risk according to the success (or failure) of the actions taken.

Although risks are identified and mitigation procedures are put in action, it is still possible that unwanted or even unexpected events occur. In order to reduce the impact of such events, Contingency Plans are defined to be applied after a previously defined trigger occurs. A contingency plan is sometimes referred to as "Plan B," because it can be also used as an alternative for action if expected results fail to materialize. Contingency planning is a component of business continuity, disaster recovery and risk management. The risk identification and classification are important steps to define the contingency plan, since they allow the identification of the most relevant indicators to act as triggers for different contingency actions. Whenever the consortium agrees it is necessary, the project will define proper contingency plans in order to bring the consequence of the undesired event resulting in risk reduction to an acceptable level.

6 RISK MANAGEMENT TIMELINE

Taking into account the project schedule, it is possible to identify key moments in which risk workshops should be performed. Before and during the execution of the actions listed below, partners should visit and revisit the Risk Register and update it according to the current status of the project.

Taking into consideration the most critical tasks and its exposure to greater risk, Table 6-1 presents the timeline for the risk assessment of those activities.

Table 6-1: Preliminary Risk Assessment Timeline

Task	Description	Task Resp.	Due date	Related Risk Task (Responsible)			
				Project (EDP)	Technical (Intecsea)	H&S (Intecsea)	Environ. (Plocan)
T2.2	Preliminary Design Review	X1	Jul 2019	X	X	X	X
T3.1	Initial Manufacturing & Assembly plan	X1	Sep 2019	X	X	X	
T4.2	Installation Plan	X1	Nov 2019	X	X	X	X
T3.2	FAT & PAT test planning	X1	Dec 2019	X	X	X	
T2.3	Detailed Design Review	X1	Jan 2020	X	X	X	X
T4.3	SAT and operational test planning	Plocan	Feb 2020	X	X	X	X
T3.3	Procurement, Manufacturing and FAT	Degima	Jun 2020	X	X	X	
T3.4	Portside assembly and PAT testing	Degima	Aug 2020	X	X	X	
T4.4	Installation, Commissioning and SAT	X1	Oct 2020	X	X	X	X
T4.5	Testing and Monitoring	Plocan	Oct 2021	X	X	X	X

The risk assessment will be carried out during the previous tasks and the risk register, FMECA table, etc. will be living documents being updated. The final outcomes of these Risk Assessment Activities in each phase will be integrated in Risk Deliverables planned in WP1 and WP6 and described below:

ID	Deliverable	Due date	Resp.
D1.2	Initial Project Risk Management Plan	Jun 19	EDP
D6.1	Identification of failure modes and initial reliability, Health & Safety and Environmental Assessment of the PivotBuoy System	Sep 19	Intecsea
D1.4	Update project risk management plan	May 20	EDP
D6.2	Update of reliability, Health & Safety and Environmental Assessment	Jun 20	Intecsea
D1.6	Final project risk management plan	Oct 21	EDP
D6.3	Final Reliability, Health & Safety and Environmental Assessment of PivotBuoy system	Dec 21	Intecsea
D6.5	Reliability, EHS and environmental considerations for large scale farms of floating wind platforms with single point mooring systems	Jan 22	Intecsea

7 CONCLUSION AND FUTURE WORK

The Initial Project Risk Management Plan provides the methodologies and tools for the internal process of risk assessment where the consortium will manage the project's risks providing information on who is responsible for what risks and correspondent actions

This plan is delivered in a very early stage of the project but provides what are considered to be the main guidelines for risk planning taking into consideration of PivotBuoy specifications, since it covers the risk actions from the higher level tool, the risk register, to specific procedures to determine mitigation and contingency actions. It is of major importance to involve all partners in the risks assessment since the different backgrounds and experiences may be very significant for the success of these activities. The internal communication rules will ensure the coordination and cooperation between Project Management, Design, Engineering and Operations teams and that major risks will be taken into account for and properly addressed.

The timeline for risk assessment, heavily based on the several planning activities, provide a framework for a timely execution of risks identification, evaluation and classification and description of treatment measures, as well as for identification of mitigation measures, and, if required, contingency measures.

Deliverable "D1.4 – Update project risk management plan" will include already an updated Risk Register considering the evolution and current status of PivotBuoy and "D1.6 – Final Project Risk Management Plan" will include the last project risk assessment.



ANNEX A – RISK REGISTER

Identification						Evaluation and Classification											Treatment			
#	Task	Date	Ver.	Risk	Desc.	HSE			Project				Business				Act	Resp	Dead.	Status
						Saf.	Heal.	Envir.	Scope	Cost	Sched	Quali	Oper.	Reput	Fin.	Upti.				

The allow a clear identification of each column of the Risk Register, a short descriptions is provided bellow:

- Identification
 - **Task** – Task to which risk is associated
 - **Date** – Date of risk identification
 - **Ver.** – Version of risk assessment
 - **Risk** – Identification of risk
 - **Desc.** – Description of risk
- Evaluation and Classification
 - **Project** – If project risk, classify according Table 4-1
 - **Business** – If business risk, classify according Table 4-2
 - **HSE.** – Health, Safety And Environment. If HSE, classify according Table 4-3
- Treatment
 - **Act.** – Action to be taken to treat risk
 - **Resp.** – Responsible(s) for taking care of the action
 - **Dead.** – Deadline to take the action
 - **Status** – Current status of the action (Underdoing, Finished, etc...)