Due Diligence Standard Procedure for Urban Circular Bioeconomy Projects

RdA Climate Solutions

www.hoopproject.eu

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Authors: David Ramos Silva and Jorge Rodrigues de Almeida (RdA Climate Solutions)
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List of Acronyms

Acronym	Description
BAT	Best Available Techniques
CIB	Circular Investors Board
COGS	Cost Of Goods Sold
DNSH	Do No Significant Harm
EC	European Commission
EIA	Environmental Impact Assessment
ERM	Enterprise Risk Management
EU	European Union
EU ETS	EU Emission Trading System
GHG	GreenHouse Gas
HR	Human Resources
IP	Intellectual Property
IT	Information Technology
LCA	Life-Cycle Assessment
MAGA	Material Adverse Government Action
MSME	Micro, Small, Medium-sized Enterprises
NACE	*Nomenclature statistique des Activités économiques dans la Communauté Européenne* - statistical classification of economic activities in the European Community
NGO	Non-Governmental Organisation
OECD	Organisation for Economic Cooperation and Development

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Acronym	Description
O&M	Operation & Maintenance
PDA	Project Development Assistance
P&L	Profit and Loss statement
PML	Project Maturity Level
PPP	Public-Private Partnership
KYC	Know-Your-Customer
R&D&I	Research & Development & Innovation
SME	Small and Medium-sized Enterprises
TRL	Technology Readiness Level
UCBE	Urban Circular BioEconomy
UN	United Nations

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1. Executive Summary

The present Due Diligence Standard was financed and developed by the HOOP project. HOOP project aims to unlock bio-based investments and deploy local bioeconomies in Europe through a systemic and cross-cutting approach. It offers project development assistance to a group of eight Lighthouse Cities and Regions to build the technical, economic, financial and legal expertise needed to develop investments to valorise biowaste and wastewater, with the aim of obtaining safe and sustainable bio-based products.

Due diligence is an important business technique to consider before making any key business decisions, such as implementation or financing a new project. Actually, there is no due diligence standard applied to Urban Circular BioEconomy (UCBE) projects. Most of the due diligence applied to UCBE projects are confidential and performed by large companies, banks, funders/investors and consultants. Therefore, great efforts were allocated to standardise this Due Diligence process as much as possible, providing a standard framework for detailed due diligence as a basis for bankable projects.

This Due Diligence was designed as a standard procedure applied to UCBE projects. Thus, the Due Diligence standard procedure is characterised as ongoing/continuous, multidisciplinary, proactive and reactive process through which Project Parties (Promoter, PPP, Public Entity, Contractor, etc.) can ensure that they covered several risk areas in order to deliver a responsible and successful project implementation.

This Due Diligence corresponds to a shorter and public edition that was created and disseminated as open-access. However, an extended and complete version of this Due Diligence was developed as confidential document under the HOOP project.

An innovative multistep methodology was followed to develop the Due Diligence standard, involving 1) an inventory of relevant and recognised due diligence standards; 2) design of the risk matrixes for each risk area, with a set of questions/indicators (relevance section), a checklist of all documentation (evidence section), a risk allocation/responsibility section to identify which Party will bear the risk, and prevention and mitigation measures section; 3) consultation of HOOP's financial partners; 4) consultation of external experts; 5) consultation of the HOOP Circular Investors Board to ensure that this Due Diligence complies with all the financial requirements and the process can be accepted in the future as a valid due diligence process; 6) presentation and discussion of the Due Diligence's risk areas and related key aspects during the 4th CIB meeting (2022); and 7) public Due Diligence Workshop held during the HOOP's Circular Investors Day in Porto (Portugal, 2022), attended by investors, banks, researchers, enterprises, project developers, cities, public entities, among others, in order to increase the confidence in the developed due diligence process and standard.

The Due Diligence standard covers 22 risk areas, such as credit; currency; financial market; governance and management; interface and partnering; regulatory; land availability and site; permitting and intellectual property; construction; technology; IT (Information Technology); supply chain; circularity; performance; O&M (Operation & Maintenance); bioproduct; environmental; social and cultural heritage; political and MAGA (Material Adverse Government Action); and EU Taxonomy. However, other risks concerning human resources, force majeure

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events and compliance with regulations and standards were not considered as specific risk areas, because they are transversal to those 22 risk areas.

Hence, this Due Diligence standard procedure is a base, i.e., a starting point, which may and should be tailored to the specificities of each UCBE project, given the great diversity of typologies, scales, valorisation technologies and bioproducts involved.

In conclusion, using this Guidance, Project Promoters are de-risking and increasing the bankability of their projects. Cities and entrepreneurs are better prepared to prevent and mitigate some risks, if they want to keep having green funding and financing supports. Thereby, European cities and regions will be able to accelerate their transition to a low-carbon, resilient and resource-efficient economy through the implementation of the Due Diligence standard in order to monitor, prevent and mitigate several key risks and, therefore, complying with requirements and goals from public policies and strategies toward a circular and carbon-neutral economy by 2050.

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2. Due Diligence at a glance

The HOOP project, "Hub of circular cities bOOsting Platform to foster investments for the valorisation of urban biowaste and wastewater", emerges to unlock bio-based investments and deploy local bioeconomies in Europe through a systemic and cross-cutting approach. It offers project development assistance (PDA), budgeted with EUR 5.78 million, to a group of eight Lighthouse Cities and Regions to build the technical, economic, financial and legal expertise needed to develop concrete investments to valorise biowaste and wastewater sludge, with the aim of obtaining safe and sustainable bio-based products [1].

The PDA will focus on a variety of projects within the cities and regions with different investment volumes planned that are expected to be complemented by public and private investments. In this context, the **Due Diligence standard procedure was developed to be applied to Urban Circular BioEconomy (UCBE) projects with a high impact for investors and project developers given that, actually, there is not a standard procedure within this field**.

2.1. Contextualisation

In Urban Circular BioEconomy (UCBE) projects for the production of bioproducts from biowaste and wastewater sludge, companies, Public Entities and PPP (Public-Private Partnership) have the potential to generate income, growth and prosperity, circularity, sustain livelihoods and foster local development. In such situations, project Promoters may also be at risk of contributing to or being associated with significant adverse impacts that affect the environment, heritage and local communities. At the same time, the project must comply with several risks associated with the financing (credit, currency, financial market, EU Taxonomy), Project Parties (governance and management, interface and partnering), project activities (regulatory, land availability and site, permitting and intellectual property, construction, technology, information technology, supply chain, performance, operation and maintenance, bioproduct, circularity and demand) and their impacts (environmental, climate, social and cultural heritage, political and MAGA – material adverse government action) [2, 3, 4, 5].

In this context emerges the due diligence procedure, that is an ongoing, proactive and reactive process through which Project Parties (Promoter, PPP, Public Entity, Contractor, etc.) can ensure that they covered several risk areas in order to deliver a successful project/business implementation. Due diligence can also help the Promoters ensure they observe European and International law and comply with domestic laws, concerning several matters and activities of the project. Hence, risk-based due diligence refers to the steps companies should take to identify and address actual or potential risks in order to prevent or mitigate adverse impacts associated with their activities or decisions [2, 3, 4, 5].

Actually, there is no due diligence standard applied to Urban Circular BioEconomy (UCBE) projects. Most of the due diligence applied to UCBE projects are confidential and performed by Private Parties such as

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large companies, banks, funders/investors and consultants. Therefore, the present Guidance provides a standard framework for detailed due diligence as a basis for bankable projects.

However, there are other European and International Due Diligences applicable to other contexts, for example the human rights due diligence specified and further developed in the OECD Guidelines for Multinational Enterprises, which extended the application of due diligence to environmental and governance topics [6]. The OECD Guidance on Responsible Business Conduct and sectoral guidance [7] are internationally recognised frameworks setting out practical due diligence steps to help companies identify, prevent, mitigate and account for how they address actual and potential impacts in their operations, value chains and other business relationships. The concept of due diligence is also embedded in the recommendations of the International Labour Organisation concerning Multinational Enterprises and Social Policy.

An increasing number of EU companies/Promoters/PPP are using the existing international voluntary standards on responsible business conduct and value chain due diligence as tools to identify risks in their value chain and build resilience to sudden changes in the value chains; however, Project Parties may also face difficulties when considering to use the value chain due diligence for their activities. Such difficulties can be for instance due to a lack of legal clarity regarding corporate due diligence obligations, complexity of value chains, market pressure, information deficiencies, and costs. Consequently, the benefits of due diligence are not widespread among European companies and across economic sectors [8].

The purpose of this Guidance is to help Project Promoters comply with regulatory matters and avoid contributing to negative impacts resulting from Project Parties decisions, including the choice of their suppliers, (sub-)contractors and clients, and project management and activities. By doing so, this Guidance will help Project Promoters to contribute to sustainable development, circular bioeconomy, and environmental and social responsibility, while creating the enabling conditions for constructive engagement with local communities and enterprises, suppliers, clients, Municipalities and other Public Entities, NGOs and other stakeholders. In other words, by using this Guidance, Project Promoters are de-risking and increasing the bankability of their projects.

2.2. What is Due Diligence?

"A comprehensive appraisal of a business undertaken by a prospective buyer, especially to establish its assets and liabilities and evaluate its commercial potential." [9]

Due diligence is a process that involves risk and compliance checks, conducting an investigation, review, or audit to verify facts and information about a particular subject. In simple words, due diligence means doing your homework and acquiring required knowledge before entering into any agreement, implementation of a project or contract with other enterprises/Parties [2, 6, 7, 10]. Hence, due diligence is an important business technique to consider before making any key business decisions (e.g., implementation or financing a new project).

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Due diligence applied to UCBE projects helps to de-risk the project to avoid causing or contributing to adverse impacts on people, environment and society, and to seek to prevent adverse impacts directly linked to operations, products and services through business/Parties relationships.

The due diligence process enables projects and Project Parties to perform risk and compliance check to protect themselves by checking the assumptions and conditions of a mutual relationship or an offer and identifying relevant risks. What form of due diligence is appropriate depends on the specific situation, business transactions and the level of each kind of risk [2, 6, 7, 10].

2.3. What is the Due Diligence standard for UCBE projects?

This Due Diligence standard procedure aims to develop a standard framework to provide due diligence to UCBE projects. Having a standardised approach enables to reduce costs for all stakeholders and the perceived risk of UCBE projects from the investors and the private sector point of view by revealing the real risks and benefits of circular economy-based investments. Hence, this due diligence was designed in order to identify, assess, prevent and mitigate several types of risks that may affect the UCBE projects.

2.4. What are the Due Diligence's objectives?

The objectives of this Due Diligence Standard Procedure are focused mainly into:

- Obtain key information to appropriately assess the Promoter(s), and other Project Parties, and respective UCBE project;
- Identify and assess the potential particular risk aspects (relevance section in the risk matrixes) of each risk area;
- Identify the Project Party(ies) that will bear the responsibility of each particular risk aspects identified previously under each risk area (responsibility/risk allocation section in the risk matrixes);
- Identify and assess the preventative and mitigating measures (mitigation section in the risk matrixes) that may be applied to the particular risk aspects identified previously under each risk area;
- Identify and list all relevant documentation (evidence section in the risk matrixes) needed to perform the due diligence process and assessment;
- Provide information to include in transaction deal terms;
- Identify "stoppers" and "red flags" early on, as well as opportunities, in order to improve the project proposal and prevent/mitigate and manage the risks and their impacts.

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The results of risk assessment and responsibility/allocation, impacts identified and respective plan of mitigation and risk management emerged from the due diligence process applied to UCBE projects, Project Parties and project developers are better able to submit the project to potential investors.

2.5. What was Due Diligence's methodology?

These standard guidelines for the due diligence process of circular bioeconomy projects aim to provide guidance to investors and project developers with a better understanding of the project's technical and financial risks for this type of projects. Thus, an innovative multistep methodology was followed to develop the HOOP Due Diligence standard, involving:

1) an inventory of relevant and recognised due diligence standards;

2) design of the risk matrixes for each risk area, with a set of questions/indicators (relevance section) to understand and assess such risk for the parties involved, a checklist of all documentation (evidence section) to support any of the claims made within the relevance topic, a risk allocation/responsibility section to identify which Party will bear the risk, and prevention and mitigation measures section;

3) consultation of HOOP's financial partners;

4) consultation of external experts;

5) consultation of the HOOP Circular Investors Board to ensure that this Due Diligence complies with all the financial requirements and the process can be accepted in the future as a valid due diligence process;

6) presentation and discussion of the Due Diligence's risk areas and related key aspects during the 4th CIB meeting (2022); and

7) public Due Diligence Workshop held during the HOOP's Circular Investors Day in Porto (Portugal, 2022), attended by investors, banks, researchers, enterprises, project developers, cities, public entities, among others, in order to increase the confidence in the developed due diligence process and standard.

Some guidelines and risk areas were proposed by the HOOP CIB (Circular Investors Board) to ensure that they comply with all the financial requirements and the process can be accepted in the future as a valid due diligence process. Considering that investors always assess projects based on their own due diligence process even if another one has been performed, great efforts were allocated to standardise this due diligence process as much as possible.

2.6. Why to carry out Due Diligence?

Some UCBE projects and related business operations, products or services are inherently risky because they are likely to cause, contribute to, or be directly linked to adverse impacts on the inside (affecting the performance), and outside of the project (affecting the nature, people, health or culture). In other contexts,

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project/business and Project Parties operations may not be inherently risky, but circumstances (e.g., legislation, lack of enforcement of standards, behaviour of business relationships) may result in concrete risks and adverse internal and external impacts. Due diligence should support enterprises anticipate and prevent or mitigate those impacts. In some limited cases, due diligence may help them decide whether or not to go ahead with or discontinue operations or business relationships, considering the level of risks is too high or because mitigation efforts are not feasible [7].

Effectively preventing and mitigating concrete and adverse project's internal and external impacts may also help an enterprise maximise positive contributions to society, improve stakeholder relationships and protect its reputation.

Due diligence can help Promoters and enterprises create more value by [7]:

- Identifying opportunities to reduce/optimise costs;
- Improving understanding of markets and strategic sources of supply;
- Strengthening management of company-specific business and operational risks;
- Decreasing the probability of incidents relating to matters, such as the covered by the OECD Guidelines for Multinational Enterprises [6];
- Decreasing exposure to systemic risks.

An enterprise/Promoter can also carry out due diligence to help comply with legal requirements, such as local labour, environmental, corporate governance, social responsibility, health & safety, transparency laws and standards, among others [7].

2.7. What will Due Diligence look like?

The following 11 features describe the best practices for how the project and its Promoter should carry out the due diligence process, namely [7]:

1. Due diligence is preventative.

The purpose of due diligence is first and foremost to avoid causing or contributing to adverse **external impacts** on people, the environment and society, and to seek to prevent **internal impacts** directly linked to operations, products or services through business relationships.

2. Due diligence involves multiple processes and objectives.

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The concept of due diligence involves a bundle of interrelated processes to identify adverse impacts, prevent and mitigate them, track implementation and results and communicate on how adverse impacts are addressed. Due diligence should be an integral part of enterprise decision-making and risk management.

3. Due diligence is commensurate with risk (risk-based).

Due diligence is risk-based. The measures that a Promoter/enterprise developing a project takes to conduct due diligence should be commensurate to the severity and likelihood of the adverse problem/impact. When the likelihood and severity of an adverse impact is high, then due diligence should be more extensive.

4. Due diligence can imply prioritisation (risk-based).

Where it is not feasible to address all identified internal and external impacts at once, a Promoter/project should prioritise the order in which it takes actions based on the severity and likelihood of the adverse impact or problem that affect the performance.

5. Due diligence is dynamic.

The due diligence process is not static, but ongoing, responsive and changing. Promoters/projects should aim to progressively improve their systems and processes to avoid and address external and internal impacts. Through the due diligence process, a Promoter/project should be able to adequately respond to potential changes in its risk profile as circumstances evolve.

6. Due diligence does not shift responsibilities.

Each Promoter/project in a business relationship has its own responsibility to identify and address adverse impacts. The due diligence is not intended to shift responsibilities from governments to enterprises, or vice-versa. Instead, each Promoter/project should address its own responsibility with respect to the project impacts.

7. Due diligence concerns applicable laws and recognised standards.

Due diligence must comply with applicable national laws and internationally-recognised standards. Due diligence can help Promoter/projects observe their legal obligations in the country and EU, including permitting or intellectual property rights.

8. Due diligence is appropriate to a Promoter/project's circumstances.

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The nature and extent of due diligence can be affected by factors such as the size of the project, the context of its operations, its business model, its position in supply chains, and the nature of its products or services. Large projects, with expansive operations and many products or services, may need more formalised and extensive systems than smaller UCBE projects to effectively identify and manage risks.

9. Due diligence can be adapted to deal with the limitations of working with Parties' relationships.

Projects and Promoters may face practical and regulatory limitations to how they can influence or affect business relationships to cease, prevent or mitigate adverse impacts. Promoters can seek to overcome these challenges to influence business relationships through contractual arrangements, pre-qualification requirements, voting trusts, license or franchise agreements, and also through collaborative efforts with industry associations or cross-sectoral initiatives.

10. Due diligence is informed by engagement with stakeholders.

Stakeholder (e.g., NGOs, local communities, local MSMEs) engagement involves the timely sharing of the relevant information needed for stakeholders to make informed decisions, in a format that they can understand and access. Meaningful engagement with relevant stakeholders is important throughout the due diligence process, including the engagement with impacted or potentially impacted stakeholders and rightsholders.

11. Due diligence involves ongoing communication.

Communicating information on due diligence processes, findings and plans is part of the due diligence process itself. Thus, the project and its Promoter are able to build trust in their actions and decision-making, and to demonstrate good faith. A project should account for how it identifies and addresses actual or potential internal and external impacts and should communicate accordingly. Information should be accessible to its audiences (e.g., stakeholders, investors, consumers, etc.) and be sufficient to demonstrate the adequacy of a project's/Promoter's response to impacts.

2.8. When the Due Diligence?

The following **Figure 1** illustrates when the due diligence phase happens over the UCBE project. Then, the due diligence process starts with the Party's agreements, permitting and other consents required for the project activities, such as land for the construction and other related with the facilities and activities of the project and business. Hence, the due diligence should initiate before the physical implementation of the project and during the first critical phases of the project as construction, acquisition of technology/equipment, etc [11, 12]. Under these initial previous and initial phases of the project development, the risk is higher and for this reason the due diligence is essential to start as soon as possible, in order to identify and assess the risks and impacts and, consequently, apply mitigating and remedial measures, as well as adjustments to the agreements.

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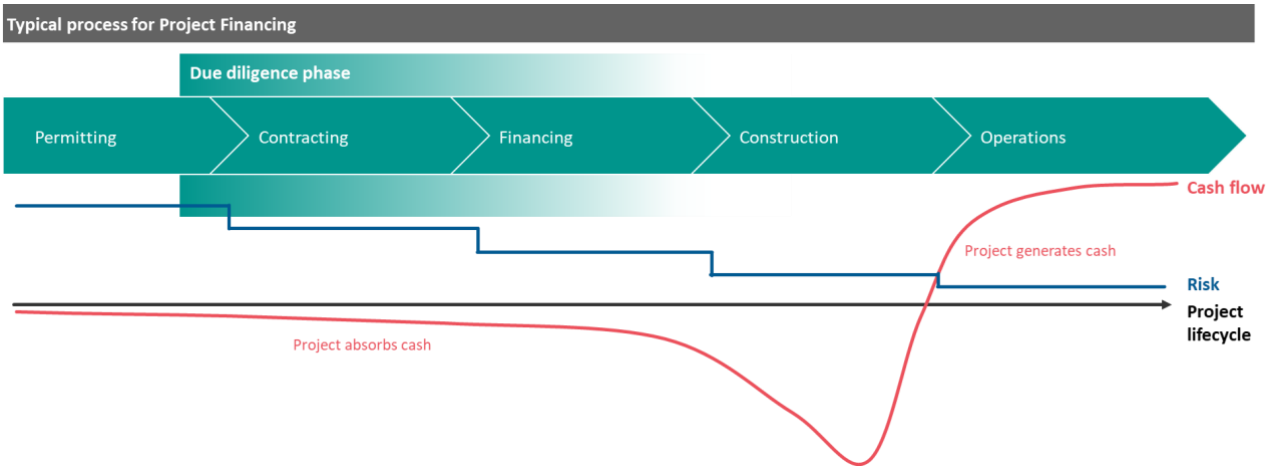

Figure 1. **Due diligence phase under typical process of UCBE project financing** [11, 12]**.**

2.9. How is Due Diligence process and lessons learned?

The due diligence process should cover the 7 steps defined by the OECD [7], which include due diligence measures for Promoters and Project developers to identify and mitigate the different risks and their internal and external impacts on the project activities and Project Parties as shown in **Figure 2**. This Due Diligence also follows this methodology and takes into account those lessons learned.

While the due diligence process is ongoing, all relevant documentation (evidence) related to the identification and assessment of the risks should be allocated to a virtual data room (e.g., clouds as *intralinks*, *merrill* and *admincontrol*). This cloud functions as a repository for storing and distribution of the documents (agreements, studies, permits, regulations, business plan, etc.). Moreover, a confidential information memorandum must be complied, i.e., an extensive “brochure” with key information about the target to inform prospective buyers [12].

Undertake due diligence to ensure the activity does no significant harm to other environmental areas, Promoters/Project Parties are obliged to disclose breaches of environmental regulations, which together with sustainability reports can cover these requirements.

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Figure 2. Due diligence process and lessons learned.

Project Promoters should also **devise and adopt a supply chain risk management plan for the energy, water and feedstocks (biowaste, wastewater sludge, etc.)** that outlines the Project Parties response to risks identified through due diligence. Companies may manage risk by either [2]:

- ► continuing trade throughout the course of measurable risk mitigation efforts;
- ► temporarily suspending trade while pursuing ongoing measurable risk mitigation;
- ► disengaging with a supplier in cases where mitigation appears not feasible or unacceptable.

Concerning the risk management plan and the **risk management strategy**, Project Promoters should [2]:

► Review the model supply chain policy to determine whether the identified risks can be mitigated by continuing, suspending or terminating the relationship with suppliers.

► Manage risks that do not require termination of the relationship with a supplier through measurable risk mitigation.

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2.10. European Directive on Corporate Sustainability Due Diligence

The behaviour of companies across all sectors of the economy is key to succeed in the Union's transition to a climate-neutral, circular and green economy in line with the European Green Deal and in delivering on the UN Sustainable Development Goals, including on its human rights- and environment-related objectives. This requires implementing comprehensive mitigation processes for adverse human rights and environmental impacts in their value chains, integrating sustainability into corporate governance and management systems, as well as in terms of the company's resilience in the longer term [8].

Companies operate in complex surroundings and, especially large ones, rely on global value chains. Given the significant number of their suppliers and the overall complexity of value chains, EU companies may encounter difficulties to identify and mitigate risks in their value chains. Identifying these adverse impacts in value chains will become easier, if more companies exercise due diligence and thus more data is available on human rights and environmental adverse impacts [8].

Mostly large companies have been increasingly deploying due diligence processes as it can provide them with a competitive advantage. This also responds to the increasing market pressure on companies to act sustainably as it helps them avoid unwanted reputational risks. However, these processes are based on voluntary standards and do not result in legal certainty [8].

In this European and International context emerges the European Parliament and of the Council propose a Directive on Corporate Sustainability Due Diligence on 23 February 2022 [8], and amending Directive (EU) 2019/1937. This Directive aims to ensure that companies active in the internal market contribute to sustainable development and the sustainability transition of economies and societies by identifying, preventing, mitigating, ending and minimising potential or actual adverse impacts on human rights and the environment in relation to their own operations, subsidiaries and value chains. In particular, the Directive will:

1. **improve corporate governance practices** to better integrate risk management and mitigation processes of human rights and environmental risks and impacts;
2. **avoid fragmentation of due diligence requirements** in the single market and create legal certainty for businesses and stakeholders as regards expected behaviour and liability;
3. **increase corporate accountability for adverse impacts**, and ensure coherence for companies regarding obligations under existing and proposed EU initiatives on responsible business conduct;
4. **improve access to remedies for those affected by adverse human rights and environmental impacts** of corporate behaviour;
5. **being a horizontal instrument focussing on business processes, applying also to the value chain**, this Directive will complement other measures in force or proposed.

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3. Due Diligence for UCBE projects

The present c Due Diligence standard applied to UCBE (Urban Circular Bioeconomy) projects covers **22 risk areas** as credit; currency; financial market; governance and management; interface and partnering; regulatory; land availability and site; permitting and intellectual property; construction; technology; IT (Information Technology); supply chain; circularity; performance; O&M (Operation & Maintenance); bioproduct; environmental; social and cultural heritage; political and MAGA (Material Adverse Government Action); and EU Taxonomy.

This Due Diligence was created as a standard procedure guideline for the UCBE projects proposed to invest and develop by public and private entities. **Obviously, the Due Diligence standard procedure is a base, i.e., a starting point, which may and should be adapted to the specificities of each UCBE project**, given the great diversity of typologies, scales, valorisation technologies and bioproducts involved.

3.1. Purpose of the risk matrixes and prior remarks

The risk matrixes presented, together with guidance on how those risks are typically allocated between the Project Parties, the rationale for such risk allocation, mitigation measures and possible support arrangements are typically found in UCBE projects. **These risk matrixes may also be applied for projects with PPP (Public-Private Partnership) contract**, aiming to provide governments and, additionally, private sector stakeholders, with targeted guidance on the appropriate allocation of project risks in a PPP contract.

Each Table/matrix of risk includes a set of questions/indicators (**relevance** topic) essential to understand and assess such risk for the parties involved. The Tables also includes a checklist of all available documentation (**evidence** topic) to support any of the claims made within the relevance topic, which are necessary to due diligence assessment. Moreover, the responsibility and mitigation measures linked to the questions/indicators are also included in order to identify the **risk allocation** and **mitigation** solutions for those risks identified respectively. The following **Table 1** schematises the structure of the risk matrixes and respective kind of sections and its contents applied to Due Diligence of UCBE projects.

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Table 1. Risk matrix applied to the UCBE project and involved parties.

Risk	Indicators		Checklist
Relevance	Subtopic/ Aspect	Question concerning the existence of risk area and its thematic subtopic/aspect. Sometimes, it may also be necessary to specify values and indicative or more descriptive answers.	Risk present? Yes / No / NA
Responsibility/ Risk allocation	Subtopic/ Aspect	Question concerning the risk allocation, i.e., which Project Party bears the risk and its impacts asked before in the Relevance section. Sometimes, it may also be necessary to specify values, calculations and indicative or more descriptive answers.	Risk bearer? Promoter / Contractor / Subcontractor / Client / Public Entity / Shared (specify) / NA
Mitigation	Questions concerning the implementation of some mitigation measures in order to reduce the impacts of risk area and its particular aspects questioned before in the Relevance and Responsibility sections.		Fully mitigated? Yes / No / NA
Evidence	All relevant documentation regarding the risk area, and its particular aspects, and the respective answers to the questions in the Relevance, Responsibility and Mitigation sections.		Documentation provided? Yes / No / NA

Note: This shorter public version of the Due Diligence only includes the relevance and/or mitigation topics for each risk area.

It is important to underline that this Due Diligence framework contains an indicative, but not exhaustive, list of the main risks typically to be considered in UCBE projects and their typical allocation between Promoter and Contractor, including PPP parties if applicable.

In addition, some risk areas may not be applicable to the project or other ones not mentioned that should be added. However, it may be used as a starting point for understanding the risk allocation issues commonly arising in UCBE projects and for developing an individual risk matrix for the project. A project's individual circumstances and its jurisdiction will influence the appropriate contractual risk allocation and there may be additional risks that need to be considered.

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3.2. Project Parties and risk allocation

As mentioned before, the risk matrixes include a topic/section for responsibility/risk allocation to the project Parties, namely the **Project Promoter** (or simply Promoter that may be also a PPP), **Contractor**, **Subcontractor**, **Client**, **Public Entity** and **Shared** (responsibility shared between Project Parties or Parties involved in the PPP). The following **Figure 3** illustrates the identification and conceptual definition of each Project Party and the kind of Entities that may represent. All concepts were based on business, commerce, and economic matters [9].

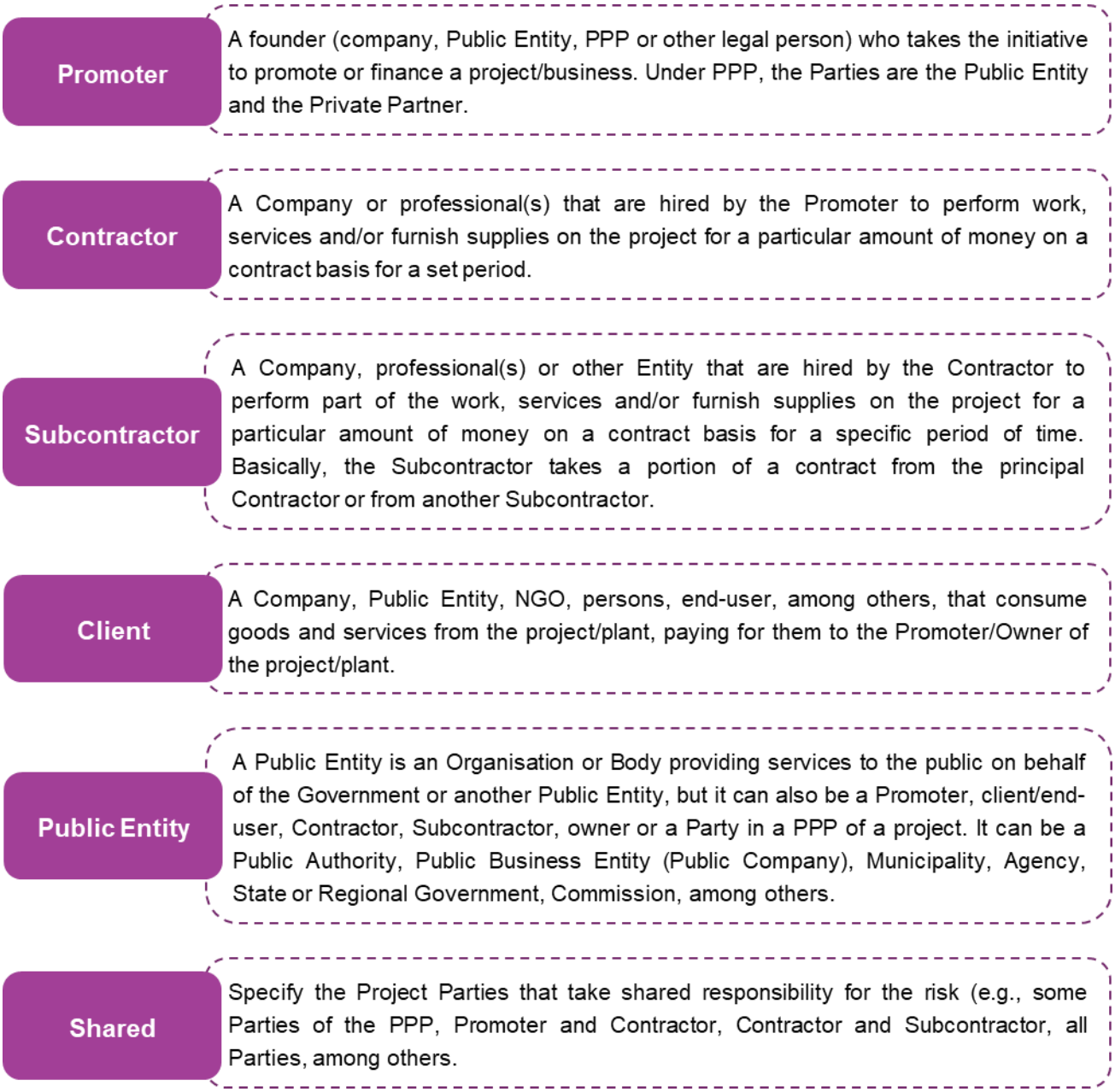

Figure 3. Identification and definition of the Project Parties.

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3.3. Mitigation measures

The risk matrix and introductory text from each risk area approach possible mitigation and compensatory measures to be implemented by the Project Party(ies) responsible for bearing the risk impacts questioned previously in the Relevance and Responsibility sections of the risk matrix.

The Promoter or PPP has most of the responsibility for the several risk areas in this Due Diligence applied to UCBE projects. Hence, some risk mitigation measures are suggested throughout the procedure, among others, such as:

- Allocation of risks to Contractors and Subcontractors.
- Apply several insurance schemes for the project.
- Effective implementation of management Plans.
- Effective implementation of monitoring, communication, evaluation, preventive and remedial action Plan applied to social, environmental, O&M (Operation & Maintenance) of equipment and processes, etc.
- Additional equity and other funding support.
- Carrying out previous detailed feasibility and ground surveys, including geological and archaeological studies, state-of-art of the technologies and bioproducts, etc.
- Running an efficient and fair procurement process.
- Timely consultation on social and environmental impacts.
- Having competent advisers and supervisors.
- Timely involvement of internal stakeholders and contract management teams.
- Careful assessment and quantification of risk.
- Taking performance security.
- Efficient Plan of communication of the project for society, through traditional and social medias at local, regional and national levels scopes, in order to communicate and disseminate the project's added value, benefits and impacts on local and regional/national scopes.
- Proceeding of previous diligences, networking, matchmaking and engagement with local and regional external stakeholders, such as NGOs (non-governmental Organisations), local MSME (micro, small, medium-sized enterprises), local communities, citizens, indigenous people, social movements, etc.
- Proceeding of previous diligences, networking, matchmaking and engagement with local and regional political parties and policymakers.

3.4. Risk areas

The following **Figure 4** summarises the 22 risk areas covered under this Due Diligence standard procedure applied to UCBE projects.

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Figure 4. Risk areas of Due Diligence applied to UCBE projects.

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The key risks are commonly the governance and management risk, permitting and intellectual property risk, technology risk, supply chain risk, environmental risk and social risk [3]. Furthermore, **there are some risk aspects regarding human resources, force majeure events and compliance with regulations and standards, that are transversal to all risk areas.**

Figure 5 illustrates a hierarchy and sequential chart of project risks from the top (governance and management, Project Parties, financing and regulatory) until the bottom with the project impacts (climate, environmental, social and cultural heritage, political and MAGA). In the middle of chart, the placed risks are related to physical implementation and performance of the project, plant's equipment and infrastructure, and material flow.

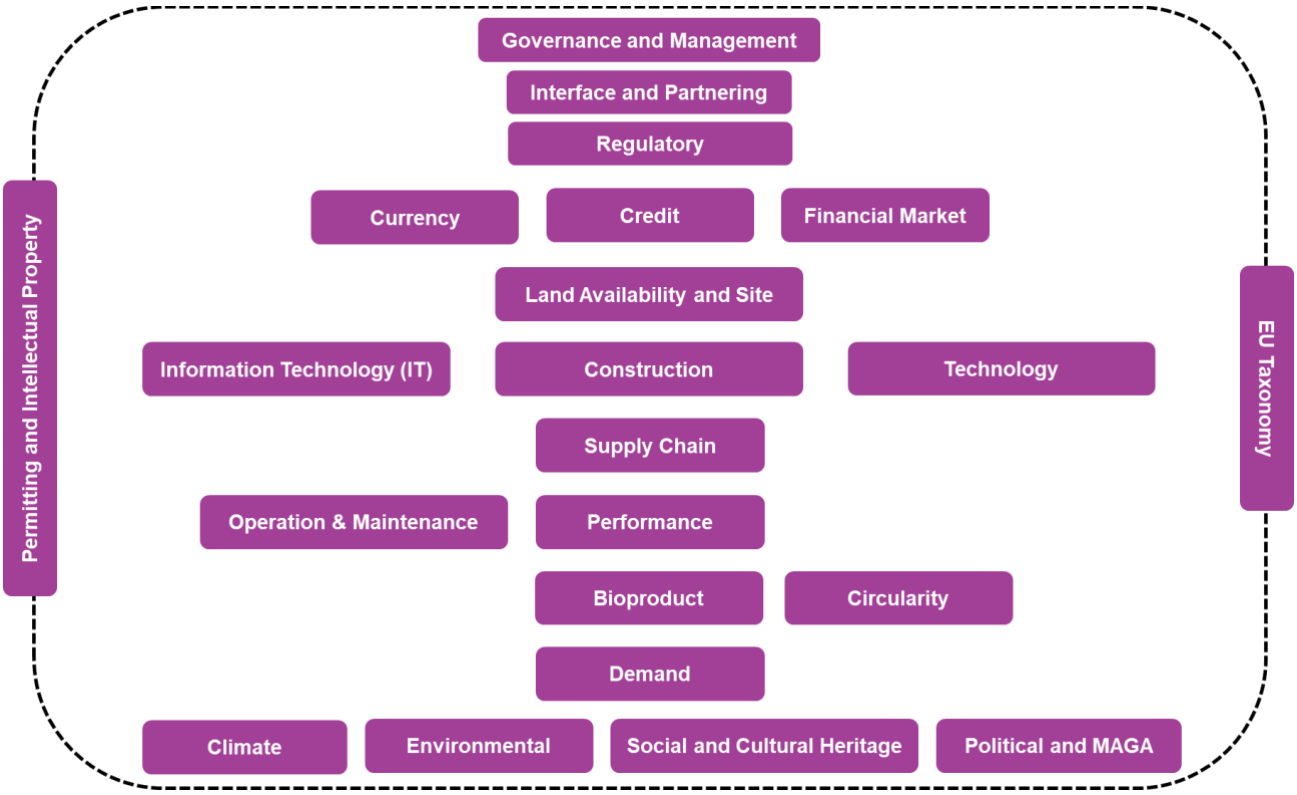

Figure 5. Hierarchy and Sequence of the Risk areas.

The project impacts at the bottom of the chart do not mean that they are the least relevant risks, but means that a good Governance and Management of the project is critical and fundamental to previously identify, assess, mitigate and control the risks associated with the project impacts – this is the concept and methodology of **risk management process**, namely:

1st identification of existing or potential risks;

2nd assessment of the risks;

3rd control of the risks through prevention, mitigation and/or adaptation measures/responses;

4th evaluation and review of the measures and controls of the risks [3].

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Thus, a good project management and governance means to predict, prevent and minimise the risks positioned at the middle and bottom of **Figure 5**, i.e., their magnitude will be lower and/or insignificant.

The permitting and intellectual property risk is essential to all risks, because the project must plan and obtain previously the required consents. The EU Taxonomy is another risk that crosses all other risk areas, because its requirements with technical screening criteria and thresholds cover specific aspects of each risk area.

3.5. Credit risk

Credit risk refers to a lender's risk of having its cash flows interrupted when a borrower does not pay principal or interest to it, i.e., it is the risk of loss due to a borrower not repaying a loan. **The credit risk is higher when the borrower does not have sufficient cash flows to pay the creditor, or it does not have sufficient assets to liquidate make a payment** [9, 14]. For this reason, the following **Table 2** includes a set of financial indicators essential to understand and assess the credit risk for the Project Parties involved [4].

The main financial indicators selected give a company's background about liquidity, solvency, profitability and supply chain ratios to assess the credit risk. This risk is a lesser issue where the selling party's gross profit on a sale is quite high. Otherwise, if gross margins are small, credit risk becomes a critical issue, forcing sellers to engage in detailed credit analyses before allowing sales on credit [14]. If the risk of non-payment is higher, the lender is more likely to demand compensation in the form of a higher interest rate.

Table 2. Credit risk applied to the UCBE project and involved parties.

Credit Risk		Indicators	Formulas
Relevance	Liquidity	Current ratio	total current assets / total current liabilities
		Quick ratio	(cash + cash equivalents + marketable securities + current account receivables) / total current liabilities
		Absolute comparison	current ratio – quick ratio
	Solvency	Solvency Ratio	after-tax net operating income / total liabilities
	Profitability	Net profit margin	after-tax net income / total revenue
		Commercial profitability	EBITDA / total revenue
		Debt service coverage ratio	net operating income / total debt service
	Supply chain ratios	Working capital	current assets – current liabilities
		Days of receivables	(commercial receivables x 365) / total revenue

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	Days of payables	(average trade payables x 365) / COGS
	Is the UCBE project bankable or attractive for investors?	
	Is there any risk of the Project Parties not being able to pay their obligations?	

3.6. Currency risk

The currency risk results from changes in exchange rates and originates in mismatches between the values of assets and liabilities denominated in different currencies. Currency risk comprises [3]:

1) Transaction risk, or the price-based impact of exchange rate changes on foreign receivables and payables;

2) Economic or business risk related to the impact of exchange rate changes;

3) Revaluation risk or translation risk, arising when a bank's foreign currency positions are revalued in domestic currency.

Other types of risk that often accompany currency risk include counterparty risk, settlement risk, liquidity risk, and currency-related interest rate risk [3]. Hence, the currency risk is commonly referred to as exchange rate risk, arises from the change in price of one currency in relation to another. Investors or companies that have assets or business operations across national borders are exposed to currency risk that may create unpredictable profits and losses [3, 14].

Allocation of exchange rate fluctuation risk over the life of a project will depend on the relevant project jurisdiction and the nature of the project costs. In most PPPs, the Private Partner will bid and be paid (whether by the Public Entity or through user tariffs) in the domestic currency of that country. In some PPPs, the Private Partner (and its lenders) may seek to transfer the exchange rate risk to the Public Entity/host country by requiring that some or all of the contract price is linked to a foreign currency [5].

Under the construction phase of the UCBE project, exchange rate risk can arise where some or all of the construction costs are denominated in a currency different to the domestic currency. This may use up the contingency the Contractor has provided for in its financial arrangements (and priced into its bid) and/or require the Promoter to take on additional borrowing in the construction phase to finance these costs [5].

Under the operation phase of the UCBE project, a similar construction risk may arise if the Private Partner incurs operating costs in a currency different to the currency of the PPP contract payments [5].

Concerning the **exchange rate change between bid and financial close**, the Public Entity may expect the Private Partner (in a PPP) to bear the risk of an exchange rate fluctuation for a specific time period between submission of bid and financial close. To the extent the Public Entity does not cover exchange rate risk (under a PPP), the Private Partner typically looks to **mitigate exchange risk through hedging arrangements**. These should ensure that the costs that the Private Partner incurs are effectively fixed instead of fluctuating [3, 5].

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The following **Table 3** includes a set of questions/indicators essential to understand and assess the currency risk for the Project Parties [4, 5].

Table 3. Currency risk applied to the UCBE project and involved parties.

Currency Risk	Indicators	
Relevance	Currency	A single currency applied to the project covers the project cash flows, purchase of equipment/technology, etc.
		A different currency can be foreseen for any significant foreseeable operational expense throughout the project term.
	Exchange rate fluctuation	What is the exchange rate and respective outlook?
Mitigation	Contractor has hedged the currency risk through e.g., buying/selling currency futures.	

3.7. Financial market risk

The financial market risk is associated with inflation, exchange rate fluctuation, interest rate fluctuation, unavailability of insurance, and refinancing [5]. However, the exchange rate fluctuation is included in a specific risk section, the currency one. Therefore, market risk is related to the risk of losses on financial investments caused by adverse price movements, thus there is the possibility of an investor experiencing losses due to factors that affect the overall performance of the financial markets [9, 3, 14].

The **fluctuation of inflationary costs** is a greater risk in less mature markets than it is in other markets and the Private Partner's will expect that this risk is borne and managed by the Public Entity during the PPP contract term [5, 16].

Under the construction phase of the UCBE project, the risk of construction costs increasing due to inflation is typically borne by the Private Partner, who will generally price in this risk in markets where such risk can be projected and quantified. **Under the operation phase of the UCBE project**, the inflation risk is typically borne by the Public Entity (in a PPP) [5, 16].

Concerning the **interest rate change during the UCBE project**, the Private Partner (under PPP) will typically bear the risk of interest rate fluctuations over the life of the project. The Private Partner will seek to mitigate this risk through hedging arrangements. These should ensure the interest rate the Private Partner is required to pay is effectively fixed, protecting against fluctuating and adverse rate movements. The cost of such hedging will be part of the contract price bid [5, 16].

Regarding the **unavailability of insurance**, the standard approach as regards unavailability is common in mature markets. In some less mature markets, if insurance becomes unavailable, the Private Partner (under PPP contract) is typically relieved of its obligation to take out the required insurance [5, 16].

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There are two key risks associated with **refinancing** [5, 16]: **i)** the risk that a project will be unable to raise the required capital to refinance a project at a given point in time; **ii)** the risk that a refinancing of debt will create additional project risks (e.g., in terms of potential increased liabilities for the Public Entity).

The following **Table 4** includes a set of questions/indicators essential to understand and assess the financial market risk for the Project Parties [13, 4, 5, 16, 17].

Table 4. Financial market risk applied to the UCBE project and involved parties.

Financial market Risk	Indicators	
Relevance	Market rating	Market rating and respective outlook for the country where the Promoter and the Contractor are operating in.
	Inflation	Inflation rate and respective outlook.
	Interest rate fluctuation	Interest rate and respective outlook.
	Unavailability of insurance	Is there any required insurance? If so, the risk of insurance becoming unavailable or only available at a cost is present?
	Studies	Feasibility study of the project.
	Refinancing	Is there any high probability of project refinancing?
	Bonds and credits	Does the project have the potential to be financed by green bonds? If so, was it included in the financial model?
		Does the project have the potential to be financed by climate bonds? If so, was it included in the financial model?
		Does the project have the potential to sell carbon credits through EU Emissions Trading System (EU ETS)? If so, was it included in the financial model?
	Funding and financial schemes	Is the project eligible to apply for funding schemes?
		Is the project eligible to apply for financial schemes?

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3.8. Governance and management risk

Governance and management risk is associated to several factors that influence the good execution of the project. Typically, the governance of the company/enterprise has the higher responsibility on the chooses that influence the project management [3]. For this reason, the management risk is intrinsically linked with the Governance of the company and the project maturity level (PML). The factors/aspects considered in this risk are organisational policies and values, "Know-Your-Customer" (KYC) data, nature of the entity, sector of activity and ownership structure, human resources, organisational structure and project management [3, 4].

During the conception of the project is important to define the key orientations, procedures, strategies, plans and **organisational policies** of the company concerning equal employment opportunities, environmental, transparency and integrity, social responsibility, etc. Regarding the **transparency and integrity principles**, the annual reports of activities and accounts should be public available under the website of the project and Promoter, as well as other key documents such as EIA (Environmental Impact Assessment) studies, etc. All organisational policies, strategies, procedures and plans must be in accordance with the **mission, vision, values and culture** of the Organisation defined by the Governance/Promoter of the project [3].

All those aspects regarding organisational policies and values have a high impact on the society's impression. Hence, **the Governance and Management of the project should plan to use traditional** (articles, books, newspapers, TV, radio, flyers, posters, etc.) **and social** (social networks, websites, blogs, newsletters, etc.) **medias, at local, regional and national scopes, to communicate and disseminate the project's added value, benefits and impacts**. The target audiences should be addressed to local communities, citizens, local MSME, Public Entities, among others.

Concerning the **organisational structure**, the success of the project is dependent on a good and clear hierarchy with boards and departments, teams and leaders with appropriate curriculum vita. Under UCBE projects, an **Advisory Board**, and/or Supervisory Board, is an asset, because in these projects there are several innovation and legal affairs that must be clarified or introduced. This Board should be composed of experts in, for example, circular bioeconomy, environment, financing and legal matters, in order to provide strategic advice.

The following **Table 5** includes a set of questions/indicators essential to understand and assess the governance and management risk for the Project Parties [3, 4].

Table 5. Governance and Management risk applied to the UCBE project and involved parties.

Governance and Management Risk		Indicators
Relevance	Organisational policies and values	Governance of the project establishes the mission, vision, values and culture, as well as several organisational policies regarding the quality, equal employment opportunities, non-discrimination and gender

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	equality, environmental, transparency and integrity, social responsibility, workplace security, code of conduct, cybersecurity, etc.
	The Governance and Management of the project have strategies and internal procedures established.
	Project makes publicly available the annual reports of activities and accounts on the website.
KYC data	KYC data (type of entity, activity sector and code, number of employees, ownership structure, and background of key management personnel) should be required.
Nature of the entity, sector of activity and ownership structure	Risk associated to the nature of entity for several applications (funding, financial, regulatory constraints, etc.).
	Risk of incompatibility between the sector of activity and the services and products provided by the company/Promoter.
	Risk of instability concerning the ownership structure.
Human resources (HR) and boards	Risk of not existing an Advisory and/or Supervisory Board.
	Risk of the governance and management teams with inadequate background and knowledge about management.
	Personnel map with hierarchy, departments, leaders, staff, roles and responsibilities.
Project management	Project should be scored with a good PML (≥4).
	Risk of project delay due to procurement procedures.
	Risk of the project design being not suitable for the purpose required.
	Risk of the project budget slippage and schedule being extended.
	Project management and its Governance plan uses traditional and social medias to communicate the project's added value, benefits and impacts for local communities, citizens, local MSME, Public Entities, etc.

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3.9. Interface and partnering risk

The **interface risk** in due diligence comprises the agreement terms related to the roles and responsibilities between Promoter and Contractors within the project, in order to limit any interference to a minimum and ensure correct operation of equipment/technologies and processes, supply chain, O&M activities, etc. [3, 16].

The **partnering risk** is associated with the risk of the Promoter and/or its Contractors/Subcontractors not being the right choice to deliver the project due to technical failure and/or insolvency, changing in Promoter's ownership structure/status, intervention in the project by a Public Entity due to the Promoter, disputes between Project Parties or within PPP, and rupture of the PPP.

Hence, **interface and partnering risk should be managed with strategies that motivate parties to work together in a cooperative and efficient manner with an appropriate level of risk transfer based on who is best placed to manage responsibility for the risk** during the UCBE project [3].

Concerning the **Contractor failure and/or insolvency**, the Contractor essentially bears the risk of failing to have the requisite technical or financial capability to deliver the project in accordance with the contract. However, the Promoter must carry out a thorough evaluation of each bidder to ensure that it selects the right partner to deliver the project, with whom it can develop the necessary long-term partnership and meet any aspirations it may have as regards community engagement and local employment and skills development. This is particularly key in UCBE projects involving new and untested technologies where the pool of Contractors is limited [5].

Concerning the **Subcontractor failure and/or insolvency**, the Contractor is responsible for its Subcontractors and bears any associated risks, unless the Promoter imposes mandatory Subcontractors, in which case it may need to bear, or share, certain Subcontractor-related risks. Particular care needs to be taken where a Subcontractor has ownership of critical intellectual property in relation to the chosen technology, in which case robust legal arrangements should ensure that the project has access to that intellectual property if the Subcontractor abandons the project or becomes insolvent. Given this risk, it is also important to assess the capacity of any party to be involved in the construction of a number of UCBE projects at any one time [5].

The following **Table 6** includes a set of questions/indicators essential to understand and assess the interface and partnering risk for the Project Parties [4, 5, 18].

Table 6. Interface and partnering risk applied to the UCBE project and involved parties.

Interface Risk	Indicators
Relevance	Clear roles and responsibilities established between the Promoter and the Contractor, in order to limit any interference to a minimum and ensure correct operation of the equipment/technologies, processes and the whole project.
	Risk of the Contractor and Subcontractor failing the requisite technical (failure) and financial capability (insolvency) to deliver the project in accordance with the contract.

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	Risk of changing in Promoter's ownership structure and/or status.
	Risk of intervention in the project by a permitted Public Authority due to the Promoter fault.
	Risk of disputes between Project Parties or within the PPP.
Mitigation	Agreement includes a removal cost clause in case of breach or pre-emptive unilateral termination of the agreement.

3.10. Regulatory risk

Regulatory risk refers to the probability of a change in applicable laws and compliance with mandatory regulations that might materially impact the UCBE project and its feasibility and parties, business, market and sector. The risk of compliance with applicable law, changes in law and other particular issues affect the performance and costs of the UCBE project [5]. The compliance is a transversal question for almost all risks considered in this due diligence. For this reason, **under the regulatory risk is only approached the key/relevant laws that the UCBE project must comply with**, i.e., the regulations that govern the project such as any relevant environmental, social responsibility, health & safety and others.

Compliance with applicable law and mandatory regulation is each party's risk. The Private Partner (under PPP) is typically subject to an express contractual obligation and will be in breach if it does not comply with applicable law, subject to change in law relief. The contract must be clear what laws and other mandatory regulations and industry codes the Private Partner is obliged to comply with. Compliance by third parties is likely to be a Public Entity risk where it has failed to enforce compliance [5, 16]. The Public Entity (under PPP) should be mindful of how it will fund changes in law which are at its risk should they arise [5].

Some key regulatory barriers may make the project unfeasible. For example, **regulatory barriers for using of food waste supply into production of bio-based products**. This aspect is included in the regulatory risk and not in the bioproduct risk, because it is a key issue prior to the bioproduct design and commercialisation. Another very particular aspect, depending on the region, is associated to **the big competition for food waste supply with "industrial" livestock farming**. This particular issue of food waste into livestock consumption is very critical for the project's feasibility, because it is practically impossible to compete with livestock activity.

The following **Table 7** includes a set of questions/indicators essential to understand and assess the regulatory risk for the Project Parties [13, 4, 5, 16].

Table 7. Regulatory risk applied to the UCBE project and involved parties.

Regulatory Risk		Indicators
Relevance	Incentives	Government incentives (grants, tax incentive, feed-in tariffs, white certificates, etc.) should be included in the revenue model.

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	Compliance	UCBE project must comply with any applicable law and mandatory regulation.
		Risk related to regulatory barriers for using of biowaste and wastewater sludge supply into production of innovative bio-based products.
		Risk for the security of project's supply chain due to using of food waste into livestock farming.
		Project is governed by any relevant environmental, social responsibility, health & safety and other compliance regulation.

3.11. Land availability and site risk

The land availability and site risk are associated with selecting land suitable for the project, providing it with good title and free of encumbrances, addressing indigenous and local communities' land rights, obtaining necessary planning approvals, pre-existing cultural heritage and protected areas, resettlement, providing access to the site, site security, and site and existing asset conditions.

The **Promoter typically bears the risk of selecting and acquiring the required land** interests for the project, although compulsory acquisition/expropriation or other powers required will be assessed and decided by Public Entities. In some PPPs, this aspect is also in the Public Entity's interest because on expiry of the contract the asset will typically revert to public ownership and operation [5].

During the feasibility stage, **the Promoter should undertake detailed assessments as regards ownership of the relevant land and ensure that it has a complete understanding of the risks involved in acquiring the site** and those that will affect the construction and operation of the project [5]. The project may be implemented in **green** (new infrastructure to be built over a piece of land that has never been developed) or **brown** (new infrastructure over a property or asset that was previously developed) **fields**.

Land provisions involve land acquisition before or after the contract is awarded, permanent need of additional land identified before or after the contract signature, temporary land need (e.g., for materials equipment storage during construction phase) during procurement phase or after contract signature. **The risk that the land is not suitable**, depending also on the project's design and construction plan (e.g., availability of water and power). The same aspect happens regarding the suitability and stability of the underground sits [5].

Planning consents, site access and security, costs and delays caused by re-location of existing utilities or access to utilities, costs and delays caused by a utility provider, site conditions, discovery of artefacts, fossils and other cultural finds, discovery of unexploded bombs and land mines, pre-existing environmental pollution and soil contamination are other aspects that should be considered under this risk [5]. **Public Entities must guarantee that the project's land is not classified under protected and reserve areas**.

Because of all aspects and events mentioned before, sometimes the UCBE project needs to change its location, what will increase the costs for the Promoter. Hence, previous studies, including geological and archaeological, are highly advisable.

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The following **Table 8** includes a set of questions/indicators essential to understand and assess the land availability and site risk for the Project Parties.

Table 8. Land availability and site risk applied to the UCBE project and involved parties.

Land and Site Risk		Indicators
Relevance	Land provisions	Risk of complete the process of land acquisition before and/or after the contract is awarded.
		Risk for a permanent or temporary need of additional land being identified before and/or after contract signature.
	Suitability of land and planning consents	Risk involving the security of the land suitability and stability.
		Risk of planning consents for key permits and other key approvals being delayed or not obtained during pre- and post-signature phase.
	Site access and security	Risk for ensuring the site access, and associated infrastructures, and security during construction and operation phases.
	Utilities and installations	Risk of costs and delays caused by relocation of/access to utilities and/or by utility provider.
	Site conditions	Project's land must not be classified under protected and reserve areas. Will the project be implemented in a green or brown field?
		Project undertakes geotechnical and soil surveys during the feasibility stage and disclose such information.
		Risk of discovering cultural finds and/or unexploded munitions in the site.
		Risk of pre-existing environmental pollution and soil contamination.

3.12. Permitting and intellectual property risk

The intellectual property (IP) risks refer to the analysis of what a company needs to be prepared for when deciding to protect their intellectual property and/or buying a technology [19]. Permitting services are necessary for several activities, e.g., the construction site, project execution, O&M. The IP rights are important to purchase or selling of technologies, equipment, processes, etc, as documented in the technology and IT risks.

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From the traditional risk management perspective, **intellectual property risk is categorised as both a first- and third-party risk**. From the first party intellectual property ownership perspective, the risks include the legal costs of intellectual property rights, and the loss or diminished value of intellectual property as an asset, or diminished licensing or product revenues, or challenges to title or ownership [19].From the third-party intellectual property infringement liability perspective, the risks include the legal costs to defend against an intellectual property infringement or theft suit; any resulting settlement or damages costs; design-around costs; harm to customer relationships; and negative impact on company share price [19].

A disciplined and integrated use of sound risk management practices will minimise intellectual property risk. This requires a coordinated approach by risk management, legal, financial, product development, and marketing to identify and manage the risk [19].

The following **Table 9** includes a set of questions/indicators essential to understand and assess the permitting and IP risk for the Project Parties [5, 19].

Table 9. Permitting and intellectual property risk applied to the UCBE project and involved parties.

Permitting and IP Risk		Indicators
Relevance	Permitting	All necessary project permits obtained in anticipation, including for the construction and operation, in accordance with the regulation of the country.
		Is there any risk of the project budget being exceeding due to permitting refusals or delays?
		Project team/Promoter has enough knowledge about permitting and respective regulation.
	Intellectual property (IP)	All necessary IP obtained in anticipation, in accordance with regulation of the country/site.
		All equipment/technologies and other materials purchased or developed in compliance with IP rights.
		Project team/Promoter has enough knowledge about IP rights and respective regulation.

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3.13. Construction risk

The construction risk comprises the risk of construction costs exceeding modelled costs, completion delays, project management, interface, quality standards compliance, health and safety, defects, intellectual property rights compliance, industrial action and vandalism [5].

Construction cost increases can have a variety of causes, such as mistakes in construction cost estimates, increased cost of materials, actions of the Public Entity or government, as well as delays in the construction programme. The Promoter and/or Contractor typically assumes the risk of cost increases to the extent these are not caused by force majeure, compensation or MAGA events. The Contractor will mitigate the risks it bears by passing them through as far as possible to its Subcontractors [5].

Delays in delivering the infrastructure by the relevant works completion date as at financial close can have a variety of causes, such as unavailability of construction materials, delays in shipping, variations and mistakes in programme scheduling, as well as weather events, civil unrest or industrial action and actions of the Public Entity. The Contractor typically assumes the risk of delays to the extent they are not caused by relief, force majeure, compensation or MAGA events, and are not addressed through other bespoke provisions [16].

The Private Partner (under PPP) will pass through the risks it bears as far as possible to its Subcontractors. The Public Entity may also consider imposing agreed delay damages on the Private Partner to compensate it for delay to the start of the operating phase [5, 16]. Concerning the **project management and interface with other works/facilities**, typically, the Private Partner (under PPP) assumes project management risk.

The following **Table 10** includes a set of questions/indicators essential to understand and assess the construction risk for the Project Parties [4, 5].

Table 10. Construction risk applied to the UCBE project and involved parties.

Construction Risk	Indicators	
Relevance	Cost increases	Risk of costs exceeding the construction costs assumed in the project's financial model as at financial close.
	Work completion delays	All necessary construction permits, and equipment should be obtained in due time to allow a timely execution.
	Project management and interface with other works/facilities	Risk of project management interfering with the good project execution, disregarding the initial budget and work programme.

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	Quality assurance and other construction standards	Project meeting must comply with relevant quality and construction standards.
	Liability for death, personal injury, property damage and third-party liability	Risk of liability for death, personal injury, property damage and third-party liability during the construction.
	Defects and defective materials	Project should be designed and constructed in accordance with good industry practice, completing the project free of defects and defective materials.
Mitigation	More complex or more invasive measures, especially in building environments that are used for production, essential services, etc., additional mitigation measures against delays could be required, such as a clause on liquidated damages or a construction risk insurance policy.	

3.14. Technology risk

Technology risk is a type of business risk defined as the potential for any equipment/technology failure to disrupt a business. Companies face many types of technology risks related to the equipment/(bio)technologies, namely the useful life, warranties (obsolescence risk), term of agreement, BAT (best available technology), disruptive technology risk, insurances, delays, defects and malfunctioning, certifications and policies, costs, etc. [20].

Under the technology risk is common to integrate the IT-risk management. However, **in this risk area the focus is the equipment/technologies and respective processes in UCBE projects**. However, an IT risk section was created separately in order to treat specific issues related to IT management.

The following **Table 11** includes a set of questions/indicators related to equipment/technology, essential to understand and assess the technology risk for the Project Parties [13, 4, 20].

Table 11. Technology risk applied to the UCBE project and involved parties.

Technology Risk	Indicators
Relevance	Concerning the obsolescence risk, is the useful life of the equipment/technology higher than the term of agreement?
	TRL of the equipment/technologies scored with a good level.

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	Disruptive technology risk - the risk that a new emerging technology unexpectedly displaces the project's technology.
	Equipment/technologies are complying with regulations, standards and certifications (e.g., ecodesign, BAT).
	Equipment/technologies insured with respective policy.
	Risk of the project budget being exceeding due to equipment/technology delivery delays and/or being received with defects and malfunctioning.
Mitigation	Insurances shall be obtained and maintained the warranties on all the installed equipment/technologies for a duration that is equal to or greater than the service agreement and the investment agreement period.
	Insurances of the equipment/technologies shall be obtained and maintained to a value not less than its full replacement value comprehensively against all usual risks of loss, damage or destruction by fire, theft or accident.
	Insurances shall be obtained and maintained for such amounts as a prudent owner or operator of the equipment/technology would insure for, or such amount as the Service provider/Contractor may from time to time reasonably require, to cover any third-party or public liability risks of whatever nature and however arising in connection with the equipment/technology.
	Insurances shall be obtained and maintained against such other or further risks relating to the equipment/technology as may be required by law, together with such other insurance as the Service provider/Contractor may from time to time consider reasonably necessary.

3.15. IT risk

Companies face many types of IT risks related to the equipment/technologies, such as information security incidents, cyber-attacks, password theft, service outages, etc. Hence, the due diligence developed for this kind of risk took into account the following aspects: the information and cybersecurity; resilience and disaster recovery; vendor and third-party management; project and change management; architecture, development and testing; data quality, governance and HR; IT compliance and protection of data [20].

In many companies, IT-risk management is disconnected from enterprise risk management (ERM) and even from the operational-risk team. That inhibits the enterprises' ability to prioritise the risks that are of critical importance and deploy the resources to remediate them. A contributing factor is often the absence of a common risk-management technology platform shared by both the IT-risk team and the ERM or operational-risk group. Without such a platform, companies/enterprises struggle to aggregate risk information consistently, and managers are not equipped with the data they need to make decisions [20].

The following **Table 12** includes a set of questions/indicators essential to understand and assess the IT risk for the Project Parties [20].

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Table 12. IT risk applied to the UCBE project and involved parties.

IT Risk	Indicators	
Relevance	Cybersecurity	Risk of leakage of confidential customer and internal data, fraudulent transactions, blackmail and "hacktivism".
	Resilience and disaster recovery	Risk of recurring or prolonged interruptions of IT services supporting processes that are critical for customers and company.
	Vendor and third-party management	Risk of vendors or third parties not delivering reliable and secure service.
	Project management	Risk of IT projects not delivering on schedule and/or not delivering within initial budget and/or not delivering at adequate quality.
	Architecture, development and testing	Risk of systems not being designed to deliver long-term affordable, reliable and maintainable service.
	Data quality, governance and HR	Risk of legal/regulatory or transaction-settlement issues as a result of inaccurate, inconsistent, or missing data.
		Risk of the teams, including R&D&I, with inadequate background and knowledge about IT.
	IT compliance and protection of data	Risk of non-compliance of IT systems with regulations, including protection of data.

3.16. Supply chain risk

Supply chain risk is an important aspect, because some factors can cause interruptions to the flow of feedstocks and energy within the projects' supply chain. Therefore, supply risk refers to any risk relating to the operation or organisation of a supplier that may potentially have a negative impact on the activity of a project/enterprise. **For UCBE projects, the energy, water and feedstock (raw materials, biowaste) supplies are more critical.**

The lack of robust processes to identify and successfully manage growing supply chain risks is critical as the world becomes more interconnected. Cyber-attacks, wars and geopolitical issues are emerging and impacting the supply chain. The challenge of supply chain risk management has been exacerbated by globalisation, where even raw materials, waste, products, technology that may have imported in countries where the due diligence has never been applied, and the quality requirements and social and environmental regulation have never been complied [21].

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There are **supply chain management mitigation approaches** widely used, such as [18]:

- Increasing capacity engagement through redundant suppliers;
- Increasing oversight and responsiveness;
- Increasing inventory and working capital;
- Increasing company and supply flexibility;
- Aggregating demand to reduce uncertainty & forecast error.

Under PPP, there are two issues to look at in the context of supply risk relating to biowaste and wastewater sludge supply: i) the extent to which the Private Partner will accept risk in relation to the volume of waste supplied by the Public Entity; and ii) the extent to which the Public Entities should allow the Private Partner to size the relevant facility so that it can handle volumes of waste in excess of the Public Entity's own requirements [5].

The following **Table 13** includes a set of questions/indicators essential to understand and assess the supply chain risk for Project Parties [13, 4, 17]. In the cases where the energy can be supplied from several types of sources, the **Table 13** should be filled in for each type of energy input (electricity, gas, fuels, etc.). The same procedure should be followed for each type of feedstock (biowaste, wastewater sludge, raw materials, etc.).

Table 13. Supply chain risk applied to the UCBE project and involved parties.

Supply Chain Risk		Indicators
Relevance	Energy (electricity, gas, fuels, etc.)	Project's financial model takes into account the evolution of energy prices and inflation rates.
		Risk for the security of energy supply.
		Risk of high dependence on fossil fuel consumption. Project with self-renewable energy consumption?
		Risk of low energy efficiency of the project.
	Water	Project's financial model takes into account the evolution of water prices and inflation rates.
		Risk for the security of water supply and of lack of storage space/volume for water.
		Risk on the water quality.
	Feedstock (biowaste	Project's financial model takes into account the evolution of feedstock prices and inflation rates.

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	and digestate) and other raw materials	Risk for the security of supply of raw materials, biowaste and/or digestate, and lack of storage space/volume for feedstocks.
		Ris on the quality of raw materials, biowaste and/or digestate.
		Risk of big number of competitors in the feedstock market.
Mitigation	Service provider/Contractor has hedged the energy, water and feedstock price risk (e.g., through buying/selling energy).	

3.17. Performance risk

The performance risk is related to the potential that a product and service will not deliver as much value as required, i.e., when the project fails to produce results consistent with project specifications, efficiency and performance measures that reduce the costs and resources consumption allowing, at the same time, delivering the same (or with better quality) product and service. Therefore, the performance risk impacts project goals and outcomes.

A **detailed Plan with implementation of efficiency (resources) and performance improvement measures**, monitoring/measurement and evaluation, including indicators, schedule of activities, remedial actions, as well as a performance insurance, are fundamental for the UCBE project in order to mitigate the performance risk.

Under PPP, the Public Entity is responsible for enforcing the performance regime and for ensuring that the performance specifications are attainable and properly tailored to what the Private Partner can deliver based on relevant market data and policy objectives. Performance based on increased recycling, landfill reduction, among others, can be measured against policies and standards [5]. The technical performance of the waste facility/project is key, and the Public Entity must carry out due diligence on the parties and the proposed technology to assess its viability [5].

Concerning the **force majeure risk**, this one is also critical for the project's performance. Force majeure is an event (or combination of events) outside the reasonable control of the contracting parties which prevents one or both parties from performing all or a material part of their contractual obligations. Force majeure is typically treated as a shared risk [5, 16].

The following **Table 14** includes a set of questions/indicators essential to understand and assess the performance risk for the Project Parties [4, 5, 18].

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Table 14. Performance risk applied to the UCBE project and involved parties.

Performance Risk	Indicators
Relevance	Risk of project design with flaws or defects that could affect the performance.
	Risk of errors in the operation of measurements by the Service Provider/Contractor and/or Promoter.
	Monitoring/measurement and evaluation plan, with appropriate indicators, applied to efficiency measures and reduction of costs.
	Risk of low procedures and standards concerning the performance improvement as efficiency measures, reduction of costs, modernisation of processes, mitigation of environmental impacts, etc.
	Risk of occurrence of unexpected force majeure events.
Mitigation	Service provider/Contractor purchases performance insurance.
	Public Entity/Promoter requires that the Service provider/Private Partner provides "continuity of service" by finding alternative disposal outlets for waste that cannot be processed at its own waste facility due to failures to achieve expected levels of operational performance.
	Project insurance that may compensate physical damages and loss of revenues due to force majeure events.

3.18. O&M risk

The O&M (operation & maintenance) risk comprises the risk of events affecting performance or increasing costs beyond modelled costs, performance standards and price, availability of resources, intellectual property rights compliance, health and safety, compliance with maintenance standards, interface, industrial action and vandalism [5]. **A monitoring, communication, evaluation and remedial action plan should be included in the UCBE project in order to mitigate the O&M risk.**

When the Promoter or Contractor retains legal and financial ownership of the equipment, ensuring careful operations and timely maintenance of the equipment throughout the service period is incentivised. According to some agreements, the Service Provider/Contractor is responsible for undertaking all O&M work over the full-service period, including also a step-in clause to allow for the replacement of Service provider/Contractor [4].

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Increased costs and delays in the operating phase can be caused by mistakes in maintenance cost estimates or even variations to extreme weather events. The Private Partner (under PPP) broadly assumes the risk of events which inhibit performance and/or give rise to cost increases beyond modelled costs, to the extent these are not relief, force majeure, compensation or MAGA events, and are not addressed through other bespoke provisions (e.g., changes in law) or hardship doctrines in underlying law. Operating costs for UCBE projects are particularly susceptible to changes arising from developments in environmental regulation [5].

The following **Table 15** includes a set of questions/indicators essential to understand and assess the O&M risk for the Project Parties [4, 5, 18].

Table 15. O&M risk applied to the UCBE project and involved parties.

O&M Risk		Indicators
Relevance	Agreements and arrangements	O&M provider is incentivised to ensure careful operations and timely maintenance of the equipment throughout the service period.
		Monitoring and communication systems used for outage detection and system performance should be implemented.
		Back-up O&M arrangements and documented and mutually agreed upon response protocols.
	Performance	Risk of increased costs and delays in the operating phase, mistakes in maintenance cost estimates or even variations to extreme weather events, as well as risk of interrupted supply of resources for the O&M activities.
	Human resources (HR)	Risk of O&M teams with inadequate background and knowledge about equipment and processes.
	Liability for death, personal injury, property damage and third-party liability	Risk of liability for death, personal injury, property damage and third-party liability under O&M activities.
	Compliance	Monitoring, communication, evaluation and remedial action plan applied to O&M equipment and processes.
		Quality and maintenance procedures, standards, certifications and regulations concerning O&M of equipment and processes.

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Mitigation	Contractual stipulations ensuring O&M service levels post-securitisation are included in the transfer agreement, as well as ensuring an uninterrupted supply of resources for the O&M activities.
	Public Entity/Promoter requires that the Service Provider/Contractor/Private Partner provides "continuity of service" by finding alternative disposal outlets for waste that cannot be processed at its own waste facility due to failures to achieve expected levels of operational performance.

3.19. Bioproduct risk

Bioproduct risk comprises the most critical factors as quality, teams with R&D&I background and regulation/standards that can interfere with the characteristics and reputation/image of bioproducts and their potential for commercialisation.

Bio-based products, or just bioproducts, are those wholly or partly made from materials of biological origin, excluding materials embedded in geological formations and/or fossilised. As they are derived from renewable raw materials such as plants and organic waste, bioproducts can help reduce CO_2 emissions and offer other advantages such as novel product characteristics (e.g., biodegradable plastic materials) [1].

The following **Table 16** includes a set of questions/indicators essential to understand and assess the bioproduct risk for the Project Parties [13, 17]. The Due Diligence applied to bioproduct risk can comprise several bioproducts from biowaste and digestate, such as **VFAs, insect protein, bioplastics, biochar, biofertilisers, compost, fibres, biofuels and bioenergy**, etc. In these cases, the **Table 16** should be filled in for each type of bioproduct.

Table 16. Bioproduct risk applied to the UCBE project and involved parties.

Bioproduct Risk	Indicators	
Relevance	Quality and HR	State-of-art study of the bioproducts applied to the project should be performed.
		Quality risk of the physic-chemical characteristics/properties of the bioproducts due to storage duration, ambient conditions, etc.
		HR risk of the teams, including R&D&I, with inadequate background and knowledge about bioproducts and their processes and biotechnologies.
	Compliance	Bioproduct(s) should be defined within the ecodesign regulation.

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		Risk of non-compliance with bioproduct regulations and standards, including respective changes of law and quality-related regulation, at national and European scopes.

3.20. Circularity risk

Circularity refers to the circular flow and efficient use and reuse of resources, materials and products. Circularity encompasses the following principles and always ensures that none of them are compromised at the expense of others, namely **materials** (infinite recyclability), **energy** (100% clean and/or renewable), **water** (sustainability harvested or recycled), **society** (cultural/social fabric of life preserved), **health** (human health and happiness improved), **prosperity** (better understand of living) [1].

Hence, enterprises have made a commitment to improving the circularity of the bioeconomy sector by promoting innovative business models that are based on the reprocessing of biological, recycled and reused raw materials. This new economic model represents sustainable green growth, moving from a consumption and disposal-based linear model to a system that extends the life of products and materials and minimises waste. The circular model has many environmental, climate, social and economic benefits [22].

The following **Table 17** includes a set of questions/indicators related to the water and feedstock (biowaste and digestate) and other raw materials, essential to understand and assess the circularity risk for the Project Parties [13, 17].

Table 17. Circularity risk applied to the UCBE project and involved parties.

Circularity Risk		Indicators
Relevance	Water	Potential of the project for water circularity and its reduction by reuse, etc.
		Risk of non-compliance with water regulation, including respective changes of law, circularity standards and certification.
	Feedstock (biowaste and digestate) and other raw materials	Risk of low recovery potential of biowaste and/or digestate, and risk on processing high quantity of virgin raw materials.
		Risk of non-compliance with feedstock regulation, including respective changes of law, circularity standards and certification.

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3.21. Demand risk

Demand risk refers to the risk on actual and forecasted demands for the bioproducts and/or services provided by the company. This risk can vary depending on bioproduct market trends, bioproduct price movement, project pipeline, compliance, revenue and contracting issues. However, **several forecasts may not accurately predict the amount of product that customers are willing and able to buy, which increases the demand risk**. **Consequently, a market mapping should be performed and included in the Business Plan of the UCBE project** [18, 21].

Common demand forecast errors are linked to excessive promotional activity, innately high volatility of demand, poor handling of data and information, poorly organised and poorly managed forecasting process, excessive forecast overrides and bias, lack of collaboration and key function participation [18].

If the UCBE plant is also designed to produce biofuels, electricity, gas and/or heat, the demand risk in relation to bioenergy also needs to be considered. Market prices for electricity and gas in many markets can be highly volatile which can lead to the Private Partner/Promoter significantly discounting the value of the electricity and gas in its gate fee pricing [5].

The following **Table 18** includes a set of questions/indicators related to the topics mentioned initially, essential to understand and assess the demand risk for the Project Parties [4, 5, 18]. Demand risk analysis can comprise several bioproducts from biowaste and wastewater sludge, such as VFAs, insect protein, bioplastics, biochar, biofertilisers, compost, fibres, biofuels and bioenergy, etc. In these cases, the **Table 18** should be filled in for each type of bioproduct.

Table 18. Demand risk applied to the UCBE project and involved parties.

Demand Risk		Indicators
Relevance	Bioproduct price movement	Project's financial model take into account the evolution/movement of bioproduct prices and inflation rate.
	Project pipeline	Risk concerning the size of the commercial project pipeline by the Service provider/Contractor with the same specifications, i.e., with similar technology, same client type (sector, maturity), same contractual agreement, and same project terms.
	Bioproduct market	Changes in bioproduct market trends.
		Project can be upscaling in terms of bioproduct production capacity in the future, as well as into new markets and geographies (for commercialisation targeted into national market and/or exportation).
		Bioproduct market mapping/study took into account under the project and its Business Model and Plan.

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		Risk of low level of awareness/training/acceptance from potential markets concerning innovative bioproducts.
		Risk for the security of bioproduct supply and capacity to provide the same bioproduct with different innovative features
		Number of competitors in the bioproduct market that can negatively affect the demand and bioproduct price.
	Compliance	Risk of non-compliance with bioproduct regulations and standards, including respective changes of law, at national and/or European scopes that can place the bioproduct market demand at risk.
	Revenue and contracting issues	How bioproduct consumption baselines are adjusted for change in market demand.
		Risk of revenues being lower than anticipated.
		Contractual stipulation in case of decommissioning of the facility.
Mitigation	Bioproduct price movement	Service Provider/Promoter has hedged the bioproduct price risk.
	Project pipeline	Alternative Service Provider/Contractors has been previously identified with the same size and specifications (technology, etc.), or at least covering some stages, for the project pipeline.
	Bioproduct market	Investment in a R&D&I unit with capacity to carry out market studies, bioproduct innovation, improvement of processes, updating and introduction of new bioproduct features (competitiveness).
	Revenue and contracting issues	Minimum payment level, as a % of the subscription value, specified in the Agreement which mitigates this specific risk type.

3.22. Environmental risk

The environmental risk is associated with pre-existing conditions, obtaining consents and studies, compliance with laws, conditions caused by the project, external events and climate events. Climate change events are included in a separate risk, the climate one.

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Under the environmental risk analysis, the project must take into account the impacts on several environmental compartments and areas, such as biodiversity, water, waste, soil, air, noise, odours, etc. Natural and technological disasters are other important aspect considered in environmental management and planning, as well as **nature-based solutions**. Other risks from this due diligence like regulatory, supply, bioproduct, circularity and performance are also linked/complemented to the environmental risk.

Some aspects should be taken into account under the environmental risk, such as [5]:

► **Obtaining environmental consents by** a) Pre-signature (before procurement); b) post-signature (after procurement); c) environmental studies (Environmental Impact Assessment (EIA), Life-Cycle Assessment (LCA), Footprint Analysis - ecological, carbon, water, etc.).

► **Compliance with environmental consents and laws**.

► **Environmental impacts caused by the project**.

► **External environmental events** can be from **outside parties' responsibility and/or Within Public Entity's responsibility**.

The following **Table 19** includes a set of questions/indicators essential to understand and assess the environmental risk for the Project Parties [13, 5, 17, 23].

Table 19. Environmental risk applied to the UCBE project and involved parties.

Environmental Risk		Indicators
Relevance	Obtaining environmental consents and studies	Environmental licenses, permits and other authorisations to be obtained.
		Project obliged to do an Environmental Impact Assessment (EIA) and other studies are desirable as LCA, footprint analysis (ecological, water, etc.).
		Risk of natural disasters (earthquakes, wildfires, floods, etc.) and technological disasters (explosions, fires, etc.) that may affect the project/site.
	Compliance with environmental consents and laws	Environmental procedures, standards, certifications and regulations that the teams and project/plant must comply with.
		Adoption of recognised European and international standards and practices.
	Environmental impacts	Study of environmental impacts of the project on the biodiversity, soil, air quality, water, waste, noise, on side/surrounding lands classified under protected and reserve areas.

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	caused by the project	Environmental Plan for the project that includes monitoring, communication, evaluation, preventive and remedial actions.
	External environmental events	Risk of occurrence of environmental events external to the project, adversely affecting it, and outside parties' responsibility.
	Human resources	Risk of the teams, including R&D&I, with inadequate background and knowledge about environmental issues and their management.
Mitigation	Service Provider/Promoter purchases insurance to cover the environmental impacts.	

3.23. Climate risk

Climate risk refers to the probability of potential impacts of climate change on the UCBE project/plant, adversely affecting the infrastructures, equipment/technologies, operation and processes, services and products, health & safety, costs and site. **The impacts are associated with hazardous/extreme weather events and the consequences of those events**. However, **the climate risk must take into account a combination of hazard exposure, vulnerability to impact, and mitigation and adaptation capacity**. Climate change risk is linked to other risks, such as physical, litigation, reputational, stockholder, regulatory, financial market, management, social, political and competition risks [23].

The predicted impacts of climate change are becoming increasingly visible and known as, among others, extreme weather events, water scarcity, erosion and loss of soil fertility, loss of biodiversity and habitats, wildfires, etc. Hence, **the potential climate impacts on the project should be included in the financial model**, **including costs and financial schemes** (bonds and credits from EU emission Trading System - EU ETS) [23].

Climate change scientific studies with related projections for the site and project are important to include in the project portfolio and design, as well as **mitigation and adaptation plans** with respective monitoring and remedial measures [23].

The following **Table 20** includes a set of questions/indicators essential to understand and asses the climate risk for the Project Parties [13, 17, 23].

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Table 20. Climate risk applied to the UCBE project and involved parties.

Climate Risk	Indicators	
Relevance	Seasonal and extreme climate events and studies	Seasonal climate events that can affect the operation of the project/plant.
		Climate change projections, that can adversely affect the project/plant and the thermal comfort of the buildings, from reliable sources (e.g., local and/or national scientific studies).
	Costs and projections	Financial model considers the current and future climate seasonal events into account.
	GHG emissions	GHG emissions contribution over the lifetime of the project/plant: LCA and carbon footprint analysis of the project.
	Monitoring, communication and climate action	Climate Change Mitigation and Adaptation Plans should be performed.
	Obtaining climate consents	Climate/emission licenses, permits and other authorisations to be obtained before and after procurement.
	Compliance with climate consents and laws	Climate procedures, standards, certifications and regulations that the teams and project/plant must comply with.
		Adoption of recognised European and international standards and practices.
	Climate conditions caused by the project	Climate obligations related to contamination and pollution and consequent mitigation and/or adaptation measures.
	Human resources	Risk of the teams, including R&D&I, with inadequate background and knowledge about climate change and its management.
Mitigation	Promoter purchases insurance to cover the climate risks.	

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3.24. Social and cultural heritage risk

The social and cultural heritage risk is related to the project impact on adjacent properties and affected people (including public protest and unrest) as well as on local cultural heritage, resettlement, indigenous and local communities land rights, local engagement, local employment and labour rights, vandalism, etc.

Under this risk there is also the probability of social demonstrations, strikes and mobilisation of NGOs, political parties, local enterprises and other external stakeholders against the project due to the bad social acceptance of bioproducts from biowaste and wastewater sludge, environmental impacts from the project, odours from the waste, noise, air, soil and water pollution, traffic from supply chain (waste, etc.) and bioproduct transportation, adverse effects and damages on local housing, infrastructures and cultural heritage, etc. Furthermore, labour rights and good working conditions, and local networking and engagement, are essential to create a healthy and safety workspace and a social peace inside and outside the project/plant.

During the feasibility stage, the Public Entity (under PPP)/Promoter should have considered **the impact on habitat, (social) infrastructure and communities generally, as well as on cultural heritage and adjacent properties and industries** – both in terms of the construction and operation of the project/plant [5, 16].

Investors and lenders may expect to see a plan addressing social impact, including the execution of any necessary contractual arrangements. All the way through construction and operations, **active stakeholder engagement** by the Public Entity (under PPP)/Promoter will be critical to avoid litigation, achieve key milestones on time and ensure it is delivering infrastructure that serves its public purpose [5].

The following **Table 21** includes a set of questions/indicators essential to understand and assess the social and cultural heritage risk for the Project Parties [5, 17].

Table 21. Social and cultural heritage risk applied to the UCBE project and involved parties.

Social and Cultural Heritage Risk		Indicators
Relevance	Social acceptance of the project	Level of social acceptance and perception concerning the new bioproducts from biowaste and wastewater sludge.
		Level of awareness of the local communities and citizens about innovative bioproducts from biowaste and wastewater sludge.
	Impacts on local communities	Impacts (on local homes – prices and damage – infrastructures, air, soil and water pollution, traffic growth, noise, odours, agriculture and local businesses, etc.) on local communities by the project/plant and its construction.
		Adoption of recognised European and international social standards and practices for protection of local communities' rights.

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	Impacts on local cultural heritage	Risk of damages on local cultural heritage (archeological, fossils, historic buildings, etc.) by the project/plant and its construction.
		Adoption of recognised European and international cultural heritage standards and practices for protection of local cultural heritage.
	Resettlement	Removal of formal and/or informal housing or businesses and resettlement of local communities in another location.
	Local networking, engagement and employment	Risk of project governance and management not establishing networking, matchmaking and engagement with local communities, including the preference of consumption of resource and goods from local suppliers.
		Impact on local employment, poverty reduction and significant recruitment of qualified personnel.
	Social demonstrations and labour rights	Risk of NGOs and other social movements being against the project implementation.
		Risk of strikes, unfair wages, gender inequality, discrimination, health and safety at the facilities.
	Vandalism	Risk of social vandalism during the construction phase and lifetime of the project/plant.
Mitigation	Previous diligences, networking, matchmaking and engagement with NGOs, trade unions, social movements, local communities, local businesses, cultural organisations and other stakeholders in order to raise awareness about the project and bioproducts and their innovation and impacts.	

3.25. Political and MAGA risk

The political and MAGA (Material Adverse Government Action) risk comprises several public actions from public entities, NGOs, political parties, trade unions, social movements, traditional and social media, legal actions, among others, that affect the social perception and the good execution/performance of the UCBE project.

However, some actions from project and its Promoter may also have high negative impact on the civil society, increasing the political and MAGA risk. The online social media and traditional means of communication increase the spreading of disinformation and bad news related to the project, what is a big issue in terms of financing and permits/authorisations. **Therefore, previous diligences, networking, matchmaking and engagement with local and regional political parties and policymakers are important to mitigate the political and MAGA risk of the UCBE project.**

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MAGA events typically includes [3, 5, 17]**:**

- Vandalism may also be a risk where the political climate opposes the bio-based project. Hacktivism is another phenomenon that may be considered under political risk.
- Deliberate acts of state such as outright nationalisation or expropriation in relation to the PPP project.
- A moratorium on international payments, debts and foreign exchange restrictions.
- Certain governmental acts, such as not granting essential approvals where the Private Partner/Promoter is not at fault or, in a bio-based project relying on an element of third-party demand, building a competing waste bio-based project adjacent to the project facility.
- Politically-inspired events, such as general/national strikes.
- Several changes in laws.

The following **Table 22** includes a set of questions/indicators essential to understand and assess the political and MAGA risk for the Project Parties [3, 5, 17].

Table 22. Political and MAGA risk applied to the UCBE project and involved parties.

Political and MAGA Risk		Indicators
Relevance	Political parties	Risk of events and actions, organised by political parties, that negatively affect the project/plant and its social perception.
	MAGA events	Risk of municipalities and/or public entities being against the project/plant not granting essential approvals and authorisations, permits and licences.
		Risk of political instability and strikes affecting the project/plant.
		Risk of several changes of national and regional laws that affect the project/plant activity.
		Risk of expropriation, moratorium on international payments, debts and foreign exchange restrictions.
	Political demonstrations and other contestations	Risk of political demonstrations and social movements against the project/plant.
	Legal actions	Risk of litigious, protective orders and other kind of legal actions against the project/plant.

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	Traditional and social media	Risk of negative information and disinformation of the project being produced and disseminated through traditional media (articles, books, newspapers, TV, radio, flyers, posters, etc) and social networks, websites, blogs, newsletters, among others.
Mitigation	Previous diligences, networking, matchmaking and engagement with political parties and policymakers, NGOs, municipalities and other public entities, and stakeholders in order to raise awareness about the project and bioproducts and their innovation and impacts.	

3.26. EU Taxonomy risk

The EU Taxonomy risk is related to the compliance with EU Taxonomy Regulation by the **UCBE project if requires financing** [13, 24, 25]. **All necessary information for the application of the EU Taxonomy to the UCBE projects are available in the public edition of Investment Package Manual for European Cities and Regions** [13].

The EU Taxonomy is a tool of common classification for sustainable economic activities and was designed to **reorient capital flows facilitating cross-border sustainable investment, while also helping in determining whether an economic activity qualifies as environmentally sustainable**. It has emerged from the EU's Action Plan on Financing Sustainable Growth [13, 24, 25]. As such, the EU Taxonomy can be used as a framework to assess the current position and track progress in terms of climate and sustainable investment towards climate action over an economic activity or project of investment.

The EU Taxonomy establishes 6 environmental objectives for:

- Climate mitigation;
- Climate adaptation;
- Protection of water and marine resources;
- Protection of biodiversity and ecosystems;
- Circular economy transition;
- Pollution prevention and control.

EU Taxonomy recognises as green, or environmentally sustainable, economic activities that make a substantial contribution to at least one of the EU's climate and environmental objectives mentioned before, while at the same time not significantly harming any of these objectives and meeting minimum social safeguards [13, 24, 25]. These **4 conditions that an UCBE project/economic activity has to meet to be recognised as taxonomy-aligned** are schematised in **Figure 6**.

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Figure 6. EU Taxonomy requirements for economic activities.

A. Be taxonomy eligible: the activity must be taxonomy eligible to contribute to environmental objectives. In other words, the activity needs to fit a NACE macro-sector category identified as being most relevant to environmental objectives and complying with the technical screening criteria, established by the Commission through delegated acts, is mandatory. Therefore, the project must be screened against activities in the taxonomy in order to evaluate if the activity is included in the list of NACE (*Nomenclature des Activités Économiques dans la Communauté Européenne)* codes of economic activities. The NACE codes are available for consultation on the website of statistical classification of economic activities in the European Community by EUROSTAT [25].

B. Demonstrate taxonomy alignment: the activity must demonstrate taxonomy alignment, which needs to make a substantially contribute to at least one of that 6 environmental objectives. Hence, the UCBE project must identify and assess the environmental substantial contribution criteria.

C. Do No Significant Harm (DNSH): the activity needs to show it doesn't significant harm to any of the other 5 environmental objectives and assessing them against their Taxonomy's technical screening criteria, carrying out a DNSH assessment of the UCBE project for those objectives.

D. Comply with minimum safeguards: minimum social and governance safeguards (human rights, anti-corruption, taxation, fair competition) are also set out in the Taxonomy Regulation and the UCBE project must comply with them (e.g., OECD Guidelines on Multinational Enterprises and the UN Guiding Principles on Business and Human Rights).

The following **Table 23** includes a set of questions/indicators essential to understand and assess the EU Taxonomy risk for the Project Parties [13, 24, 25].

Table 23. EU Taxonomy risk applied to the UCBE project and involved parties.

EU Taxonomy Risk	Indicators
Relevance	Risk of non taxonomy-eligibility of the UCBE project and its economic activity.
	Report of DNSH assessment against their Taxonomy's technical screening criteria can be fundamental.
	Minimum social and governance safeguards should be taken into account.

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4. Final remarks

During the development of this Due Diligence standard procedure applied to UCBE projects, some considerations should be taken into account before the implementation of the process, such as:

- Until now, there is not an available due diligence standard applied to UCBE projects. This Due Diligence was created based on RdA Climate Solutions' experience on other topics supported by research and consultations made with investors and other valuable experts and stakeholders. Hence, the consultation of CIB (Circular Investors Board) and other experts were fundamental to ensure that they comply with all the financial requirements, and, at the same time, the process can be accepted in the future as a valid due diligence process. Therefore, great efforts were allocated to standardise the Due Diligence process as much as possible, providing a standard framework for detailed due diligence as a basis to increase the bankability and de-risk of the projects, and their success of implementation.

- The present due diligence standard covers 22 risk areas + 3 transversal risks. However, it should be tailored to each UCBE project, considering other risks and/or excluding other ones. This Due Diligence framework contains an indicative, but not exhaustive, list of the main risks typically to be considered in UCBE projects and their typical allocation between Promoter and Contractor. Hence, some risk areas may not be applicable to the project or other ones not mentioned that should be added. However, the Due Diligence standard may be used as a starting point for understanding the risk allocation issues commonly arising in UCBE projects and for developing an individual risk matrix for the project. A project's individual circumstances and its jurisdiction will influence the appropriate contractual risk allocation and there may be additional risks that need to be considered.

- The key risks commonly considered are the governance and management risk, permitting and intellectual property risk, technology risk, supply chain risk, environmental risk and social risk. In this Due Diligence standard, some risks regarding human resources, force majeure events and compliance with regulations and standards were not considered as specific risk areas, because they are transversal to those 22 risk areas.

- Before filling in the risk matrixes, collecting all relevant documentation necessary as evidence is advisable.

- This Due Diligence standard procedure guidelines may also be applicable for PPP contracts.

- Concerning the responsibility/risk allocation to the Project Parties, the Project Parties considered were the Project Promoter, Contractor, Subcontractor, Client, Public Entity and Shared (responsibility shared between Project Parties or Parties involved in the PPP). The Project Parties and their roles in the project, and respective agreements/contracts, should be identified clearly before the implementation of the due diligence process - this aspect is important.

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- The risk matrixes include possible mitigation and compensatory measures to be implemented by the Project Party(ies) responsible for bearing the risk impacts questioned previously in the Relevance and Responsibility sections of each risk area/matrix. Typically, the Promoter or PPP has most of the responsibility for the several risk areas in this Due Diligence applied to UCBE projects. However, the risk mitigation measures are only suggestions and typical solutions considered in each risk area. Other measures may have to be considered, depending on the specificities of the project.

- The application of the Due Diligence standard procedure is dependent on the PML ranking (1 to 6), i.e., the use of this due diligence is only feasible for UCBE projects with reasonable and high PML, i.e., projects with PML equal or higher than 4.

- The Due Diligence standard procedure guidelines can be replicated and applied by other stakeholders, cities and regions aiming at developing a UCBE project. Thus, this Guidance is intended to serve as a common reference for all Project Promoters and other stakeholders involved in the bio-based projects and businesses from the valorisation of biowaste and wastewater sludge. Moreover, this Due Diligence standard should be tailored for each UCBE project in accordance with its specificities and characteristics, given the great diversity of typologies, scales, valorisation technologies and bioproducts involved.

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