Development of an Innovative Insulation Fire Resistant Façade from the Construction and Demolition Waste

DEFEAT

INTEGRATED/0918/0052

DELIVERABLE D1.3

RISK MANAGEMENT PLAN

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

DELIVERABLE INFORMATION

DELIVERABLE N°	1.3
DELIVERABLE TITLE	Risk Management Plan
WP NO.	1
WP LEADER	FRC
NATURE	Report
CONTRACTUAL DEADLINE	M3 – 30.09.2020
DELIVERY DATE TO RIF	31/03/2021

DISSEMINATION LEVEL

PU	Public	✓
CO	Confidential, only for the members of the consortium (incl. RIF Services)	

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART RESEARCH

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Table of Contents

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART RESEARCH

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

List of Figures

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

List of Tables

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

1. Introduction

Risk is a situation involving exposure to danger and can be expressed as an incident that has a likelihood of happening with the probability of a positive or pessimistic impact on a project should that risk occur. A risk may have either a single or multiple reasons and if it takes place then one or more impacts are probable. For instance, a cause may be necessitating a permission to commence the work from the authorities concerning environments or having limited personnel allocated for the project designing task. The risk event is that the authority may consume longer period for issuance of the permission than the planned time, or the assigned personnel available which may not be adequate for the designed activity. Supposing, either of these uncertain events befalls, the cost, schedule or performance of the project may get impacted. As a matter of fact, each project undertakes some element of risk and that's why tools and techniques are being applied to monitor and track those events, which are having the potential to impact the upshots of a project through risk management.

Risk management is an enduring progression that lasts throughout a project life that includes processes such as planning, identification, analysis, monitoring and control. The majority of these processes are updated all through the lifecycle of the project since new-fangled risks can be identified at any stage. On one hand, the objective of the risk management should be to slim down the probability and to minimize the negative impact of the events on the project and on the other hand, any event that could have a positive impact should be exploited.

Generally, the identification of risks begins prior to the initiation of the project and the number of risks upsurges as the project matures through the lifecycle. Once a risk is identified, it is assessed firstly to determine the probability of its occurring, the intensity of impact on the schedule, scope, cost and quality which is then prioritized. The referred risk events may either impact on merely one category or others may influence the project in context of manifold impact categories. The likelihood of occurrence, number of influenced categories and their high, medium or low intensity with which they may impact the project will be considered as the basis

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART SEARCH

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

for assigning the risk priority. After that, each recognizable risk should be accounted into a risk register and documented as a risk statement.

As part of documenting a risk, two other significant issues necessitate to be addressed. The first one is to reduce the probability of the event occurring, i.e., the mitigation steps, while the second one is a series of activities that should take place either at the time of event occurrence or before to it, i.e., a contingency plan. Often, mitigation actions to diminish the risk have a cost which at times goes beyond the cost of assuming the risk and incurring its consequences. For this reason, it is vital to estimate the probability and impact of each risk against the cost of mitigation strategy prior to deciding to implement a contingency plan. Contingency plans executed, previous to the risk occurring, are pre-emptive actions envisioned to decline the impact or eliminate the risk entirely. On the other hand, the contingency plans implemented subsequently an occurrence of risk usually can lower the impact only.

It is noteworthy that identifying and documenting events which pose a risk to the upshot of a project is nothing but just the first step. It is equally important to monitor all risks on a scheduled basis by a risk management team and an account should be kept in the project status report.

The referred plan documents the processes, tools and procedures that will be utilized for not only to manage but also to control those events that could probably have an adverse impact on the DEFEAT project. It is the document for both managing and controlling all project risks.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

2. Top Risks and Barriers of DEFEAT Project

So far as the present DEFEAT project concerned, the topmost high-probability and high-impact risks which may occur till completion of the project are as follows:

(i) ***Loosing critical staff of partner/leaving of partner at crucial point of the project***

The consortium has enough diversity and expertise to replace the leaving partner/staff by other qualified partner/staff. In case no other partner could play the role, the consortium is in the position of finding a new partner through relevant Cypriot networks.

(ii) Insufficient communication and/or lack of coordination among partners

WP leaders have been selected according to their experience to manage technical progress and all partners have been involved in the project design showing strong coordination. Management structure and procedures have been clearly defined to outline precise responsibilities and avoid lack of coordination. If necessary, the number of technical meetings will be increased, supplementary virtual meetings will be planned and work will also be reorganised.

(iii) Delay and/or insufficient quality in deliverables

A quality plan review procedure for the deliverables will reveal the problem early in advance to react. However, if the delays are inevitable, the impact on the work plan implementation will be assessed, the Research & Innovation Foundation staff also duly informed and the corrective actions agreed by project coordination.

(iv) Unacceptable behaviour or work by a partner

The management system will promptly identify this problem. WP leaders will pay attention to the partner to mend its behaviour. In case the inefficiency persists, project coordinator will monitor the situation. At extreme case, the replacement of the partner can be approved.

(v) Budget constraints

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART SEARCH

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Budget has been estimated in detail for each single activity of the project. Transfer of budget among category costs and among partners could be envisaged.

(vi) Problems on the application of the image processing on the CDW separation

The technology has already been verified in other applications and is operated successfully. Apart from that, conventional methods for the separation can be applied.

(vii) Problems on the application of the 3D printing method on producing materials

The technology has already been verified on several materials (apart from building) in lab scale. Problems related to scale-up will be dealt with by means of conventional technologies.

(viii) Developed materials do not present adequate LCA assessment

Diverse alternatives for the composition of the materials and production technologies for the fire-resistant insulation materials will be used.

(ix) Lack of scientific publications and/or updated information to the general public

Project coordinator will properly monitor the production of indexed publication and website update and will make sure the project follows the dissemination plan.

(x) Lack of European impact

The consortium is composed of partners from Cyprus and Europe (KU Leuven). The project will define a communication plan with specific dissemination activities and collaboration with other projects to make sure the impact on broader audiences. Partners' networks will be activated to ensure a high impact.

(xi) Difficulty to persuade constructors and operators in adopting the novel materials

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART SEARCH
The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

All data will be compared with existing market solutions. Market plan will focus on engaging in flagship partnerships with construction contractors, to provide for tailor-made materials. Demonstration sites will be maintained as showcases after the project. Information on market expectation will be extracted from participants in match-making events.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

3. Risk Management Approach

The approach taken to manage risks for DEFEAT project has included a methodical process by which the project team has identified, scored, and ranked the various risks. The most likely and highest impact risks were added to the project schedule to ensure that the assigned risk managers take the necessary steps to implement the mitigation response at the appropriate time during the schedule. Risk managers will provide status updates on their assigned risks in the scheduled and ad-hoc project team meetings, but only when the meetings include their risk's planned timeframe. Upon the completion of the project, during the closing process, the project coordinator will analyze each risk, as well as the risk management process. Based on this analysis, the project coordinator will identify any improvements that can be made to the risk management process for future projects. These improvements will be captured as part of the lessons learned knowledge base. Figure 1 indicate the process of Risk Management.

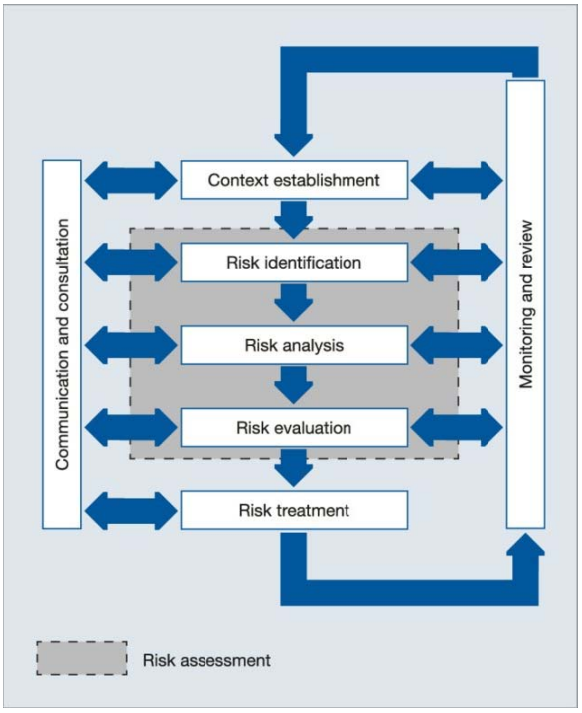

Figure 1. Overview of the risk management process.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

4. Risk Identification

A risk is any event that could prevent the project from progressing as planned, or from successful completion. Risks can be identified from a number of different sources. Some may be quite obvious and will be identified prior to project kickoff, while others will be identified during the project lifecycle. A risk can be identified by anyone associated with the project. Some risk will be inherent to the project itself, while others will be the result of external influences that are completely outside the control of the project team.

The DEFEAT Project Coordinator has the overall responsibility for managing project risk. Project team members may be assigned specific areas of responsibility for reporting to the project coordinator. Throughout all phases of the project, a specific topic of discussion will be risk identification. The intent is to instruct the project team in the need for risk awareness, identification, documentation and communication.

Risk awareness requires that every project team member be aware of what constitutes a risk to the project and being sensitive to specific events or factors that could potentially impact the project, in either a positive or negative way.

Risk identification consists of determining which risks are likely to affect the project and documenting the characteristics of each one (Figure 2). Risk communication involves bringing risk factors or events to the attention of the project coordinator and project team. The DEFEAT project coordinator will identify and document known risk factors during the preparation of the risk register.

It is the responsibility of the coordinator of DEFEAT project to assist the project team with risk identification and to document the known and potential risks in the risk register. Updates to the risk register will occur as risk factors change. Risk management will be a topic of discussion during the regularly scheduled project meetings. The DEFEAT project team will discuss any new risk factors or events and these will be reviewed by the project coordinator.

Ευρωπαϊκή Ένωση
Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART SEARCH

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

The project coordinator will determine, if any, of the newly identified risk factors or events warrant further evaluation. Those that do will undergo risk quantification and risk response development, as appropriate and the action item will be closed.

At any time during the project, any risk factors or events should be brought to the attention of the coordinator using email or any other form of written communication, to document the item. The project coordinator is responsible for logging the risk to the Risk Register. Notification of a new risk should include the following Risk Register elements:

a. Description of the risk factor or event, e.g. conflicting project or operational initiatives that place demands on project resources, unexpected study outcomes, delays, etc.
b. Probability that the event will occur.
c. Schedule impact: the number of hours, days, weeks, or months that a risk factor can impact the schedule.
d. Scope impact: the impact of the risk will have on the envisioned accomplishments of the project.
e. Quality impact: a risk event may result in a drop of the quality of work or products that will be developed. For example, lack of funding caused by cost overruns may result in the reduction of the study size and impact statistical empowerment.
f. Cost impact: the impact of the risk event, if it will occur, it will likely have an impact on the project budget.

For this project, risk identification was conducted in the initial project risk assessment meeting. The project coordinator chair held the initial risk assessment meeting and each member of the team was allowed 10 minutes to record as many risks as possible.

Ευρωπαϊκή Ένωση Ευρωπαϊκό Ταμείο Περιφερειακής Ανάπτυξης
Κυπριακή Δημοκρατία
Διαρθρωτικά Ταμεία της Ευρωπαϊκής Ένωσης στην Κύπρο
RESEARCH & INNOVATION FOUNDATION
2016-2020 RESTART RESEARCH
The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

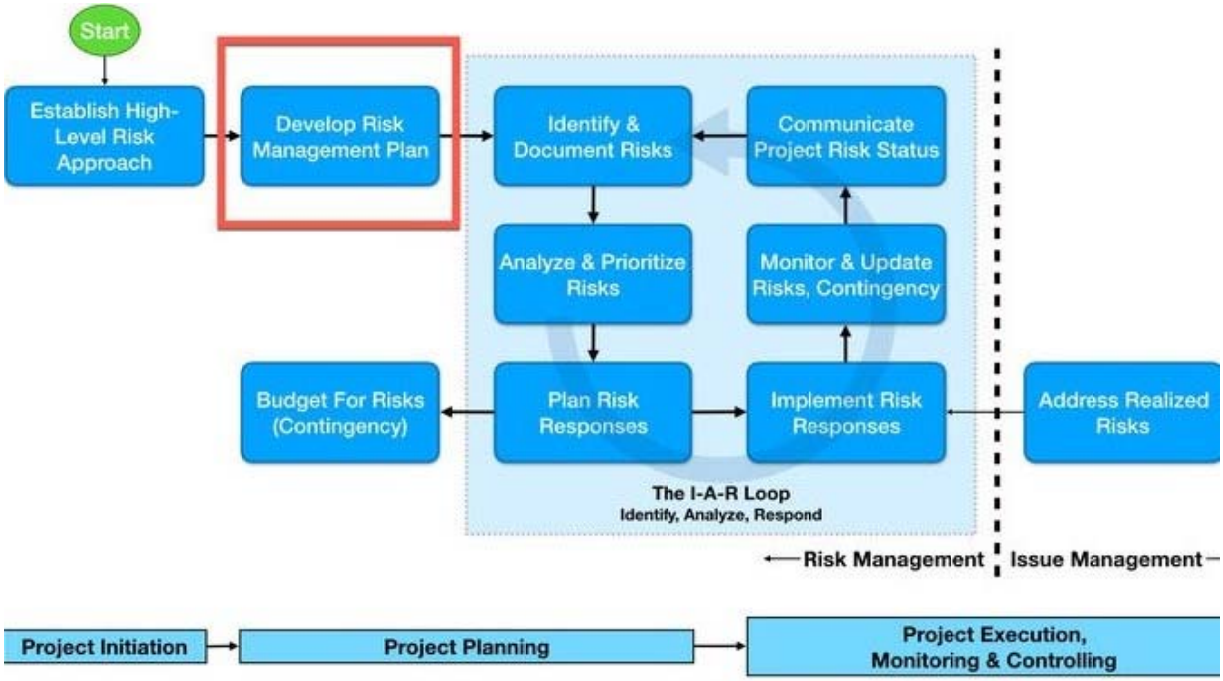

Figure 2. Risk identification method.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

5. Risk Assessment

Risk assessment is the act of determining the probability that a risk will occur and the impact that an event would have, should it occur. This is basically a “cause and effect” analysis. The “cause” is the event that might occur, while the “effect” is the potential impact to a project, should the event occur. The assessment of a risk involves two factors. First, is the probability which is the measure of certainty that an event, or risk, will occur. This can be measured in a number of ways, but the DEFEAT project will be assigned a probability as defined in the Table 1, below.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Table 1: Definitions of risk probabilities in the DEFEAT project

Probability of Occurrences			**Catastrophic**	**Critical**	**Moderate**	**Minor**	**Negligible**
Definition	**Meaning**	**Value**	**(A)**	**(B)**	**(C)**	**(D)**	**(E)**
Frequent	a. Occurs frequently b. will be continuously experienced unless action is taken to change events	5	**5A**	**5B**	**5C**	**5D**	**5E**
Likely	a. Occur less frequently if process is corrected b. Issues identified with minimal audit activity c. Process performance failures evident to trained auditors or regulators	4	**4A**	**4B**	**4C**	**4D**	**4E**
Occasional	a. Occurs sporadically b. Potential issues discovered during focused review	3	**3A**	**3B**	**3C**	**3D**	**3E**
Seldom	a. Unlikely to occur b. Minimal issue identification during focused review	2	**2A**	**2B**	**2C**	**2D**	**2E**
Improbable	a. Highly unlikely to occur	1	**1A**	**1B**	**1C**	**1D**	**1E**

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Risk Levels:

- Risk is High for codes: 5A, 5B, 5C, 4A, 4B, 3A
- Risk is Medium High for codes: 5D, 5E, 4C, 3B, 3C, 2A, 2B
- Risk is Medium Low for codes: 4D, 4E, 3D, 2C, 1A, 1B
- Risk is Low for codes: 3E, 2D, 2E, 1C, 1D, 1E

The second factor is an estimate of the impact on the project. This can be subjective assessment, but should be quantified whenever possible. The estimated cost, the duration of the potential delay, the changes in the scope and the reduction in quality are in most cases factors that can be estimated and documented in the risk statement and then measured using the standard project management tools (i.e. project plan, budget, scope of work). Rather than detailed impact estimates the Risk Register will contain five ratings for impact;

Catastrophic (A)

- Regulatory/compliance violations/issues
- Materials delays
- Production delays
- Technical miscommunications
- Security/confidentiality breeches

Critical (B)

- A non-compliance finding resulting in process, or operational degradation
- A security finding requiring immediate corrective action prior to continued operation
- Reoccurring violation of any safety regulation resulting in serious injury
- Production errors containing regulatory violations that pose direct consequence to the operation

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Moderate (C)

- Production element errors that may pose indirect consequences to the operation

Minor (D)

- No regulatory action anticipated
- No compliance impact anticipated
- Minor errors in completed the procedures
- Production errors containing quality system and / or opportunities for improvement

Negligible (E)

- No regulatory/compliance violation
- No security/confidentiality element affected
- Validated experiments
- Properly executed communications

For each of the impact categories the impact assessment should include consideration of the following areas of impact also:

- **Cost** – This impact is usually estimated as a Euro amount that has a direct impact to the project. However, cost is sometimes estimated and reported as simply additional resources, equipment, etc. This is true whenever these additional resources will not result in a direct financial impact to the project, due to the fact the resources, the equipment is currently idle and there is no cost of use, or there are other types of costs that will not impact the project budget. Regardless of whether there is a direct cost, the additional resources should be documented in the risk statement as part of the mitigation cost.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

- **Scope** – Whenever there is the potential that the final product will not be completed as originally envisioned, there is a scope impact. Scope impact could be measured as a reduction of the number of studies completed, or not providing a deliverable.
- **Schedule** – It is very significant to estimate the schedule impact of a risk event as this often results as the basis for elevating the other impact categories. Schedule delays frequently result in cost increases and may result in a reduction of scope or quality. Schedule delays may or may not impact on the critical path of the project and an associated push out of the final end date.
- **Performance/Quality** – Performance/Quality is frequently overlooked as an impact category and too often a reduction in quality is the preferred choice for mitigation of a risk. "Shortcuts" and "low cost replacements" are ways of reducing cost impacts. If not documented appropriately and approved by the funding agency, mitigation strategies that rely upon a reduction in quality can result in significant disappointment.

Most risks will be assigned one category, but some might be assigned more than one, or all.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

6. Risk Contingency Planning

Contingency planning is the act of preparing a plan, or a series of activities, should an adverse risk occur. Having a contingency plan in place forces the project team to think in advance as to a course of action if a risk event takes place.

- Identify the contingency plan tasks (or steps) that can be performed to implement the mitigation strategy.
- Identify the necessary resources such as finance, equipment, etc.
- Develop a contingency plan schedule. Since the date the plan will be implemented is unknown, this schedule will be in the format of day 1, day 2, day 3, etc., rather than containing specific start and end dates.
- Define emergency notification and escalation procedures, if appropriate.
- Develop contingency plan training materials, if appropriate.
- Review and update contingency plans if necessary.
- Publish the plan(s) and distribute the plan(s) to management and those directly involved in executing the plan(s).

Also, contingency may be reflected in the project budget, as a line item to cover unexpected expenses. The amount to budget for contingency may be limited to just the high probability risks.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

7. Risk Response

For each identified risk, a response must be identified. It is the responsibility of the project team to select a risk response for each risk. The project team will need the best possible assessment of the risk and description of the response options in order to select the right response for each risk. The probability of the risk event occurring and the impacts will be the basis for determining the degree to which the actions to mitigate the risk should be taken. One way of evaluating mitigation strategies is to multiply the risk cost times the probability of occurrence. Mitigation strategies that cost less than risk probability calculation should be given serious consideration.

The possible response options are:

- **Avoidance** – Change the project to avoid the risk. Change scope, objectives, etc.
- **Transference** – Shift the impact of a risk. It will not eliminate it; but it will simply shift the responsibility.
- **Mitigation** – Steps can be taken to reduce the probability and/or impact of a risk. Taking early action, close monitoring, more testing, etc.
- **Acceptance** – Simply accept that this is a risk. When choosing acceptance as a response is stating that given the probability of occurring and the associated impact to the project that results, they are not going to take any actions and will accept the cost, schedule, scope and quality impacts if the risk event occurs.
- **Deferred** – A determination of how to deal with this risk will be addressed at a later time. The results of the risk assessment process are documented in each Risk Statement and summarized in the Risk Register.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

8. Risk Qualification and Prioritization

In order to determine the severity of the risks identified by the team, a probability and impact factor will be assigned to each risk. This process will allow the project coordinator to prioritize risks based upon the effect they may have on the project. The project coordinator will utilize a probability-impact matrix to facilitate the team in moving each risk to the appropriate place on the chart.

Once the risks will be assigned a probability as well as an impact and will be placed in the appropriate position on the chart, the recorder will capture the finished product and the project coordinator will move the process on to the next step: risk mitigation/avoidance planning.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

9. Risk Monitoring

The most likely and greatest impact risks have been added to the project plan to ensure that they are monitored during the time the project is exposed to each risk. At the appropriate time in the project schedule a Risk Manager will be assigned to each risk. During the project team meeting the Risk Manager for each risk will discuss the status of that risk; however, only risks which fall in the current time period will be discussed. Risk monitoring will be a continuous process throughout the life of this project. As risks approach on the project schedule, the project coordinator will ensure that the appropriate risk manager provides the necessary status updates which include the risk status, identification of trigger conditions and the documentation of the results of the risk response. The system of risk monitoring is presented in Figure 3.

Figure 3. Risk monitoring system.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

10. Risk Mitigation and Avoidance

Risk mitigation involves two steps:

- Identifying the various activities or steps to reduce the probability and/or impact of an adverse risk, and
- Creation of a Contingency Plan to deal with the risk should it occur.

Taking early steps to reduce the probability of an adverse risk occurring may be more effective and less costly than repairing the damage after a risk has occurred. However, some risk mitigation options may simply be too costly in time or cost to consider.

Mitigation activities should be documented in the Risk Register and reviewed on a regular basis. They include:

- Identification of potential failure points for each risk mitigation solution.
- For each failure point document the event that would raise a "flag", indicating that the event or factor has occurred or reached a critical condition.
- For each failure point alternatives will be provided for correcting the failure.

The project coordinator has led the project team in developing responses to each identified risk. As more risks are identified they will be qualified and the team will develop avoidance and mitigation strategies. These risks will also be added to the Risk Register and the project plan to ensure that they are monitored at the appropriate times and are responded to accordingly.

The risks for this project will be managed and controlled within the constraints of time, scope and cost. All identified risks will be evaluated in order to determine how they affect this triple constraint. The project coordinator, with the assistance of the project team, will determine the best way to respond to each risk to ensure compliance with these constraints.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

In extreme cases it may be necessary to allow flexibility to one of the project's constraints. Only one of the constraints for this project will allow for flexibility as a last resort. If necessary, reallocation of budget may be considered to allow for more resources, in order to meet the time (schedule) and scope constraints. Time and scope are firm constraints and will not allow flexibility. Again, the cost constraint will be flexible only in extreme cases where no other risk avoidance or mitigation strategy will work.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

11. Risk Register

The Risk Register for this project will be a log of all identified risks, their probability and impact to the project, the category they belong to, mitigation strategy and when the risk may occur. The register will be created at the beginning of the project, led by the project coordinator. Specifically, the project team will identify and categorize each risk. Furthermore, the team will be assigned each risk a score, based on the probability of it occurring and the impact it could potentially have. Also, the Risk Register will contain the mitigation strategy for each risk, as well as the stage when the risk is likely to occur.

Based on the identified risks and timeframes in the risk register, each risk will be added to the project plan. At the appropriate time in the plan, i.e., prior to the time when the risk is most likely to occur, the project coordinator will assign a risk manager to ensure adherence to the agreed upon mitigation strategy. Each risk manager will provide the status of their assigned risk at the project team meetings for their risk's planned timeframe.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

12. Risk Responsibilities

The responsibility for managing risk will be shared amongst all the members of the project. However, decision authority for selecting whether to proceed with mitigation strategies and implement contingency actions, especially those that have an associated cost or resource requirement will rest with the Project Coordinator, who will be responsible for informing the funding agency to determine the requirement for a contract modification. The following tables details specific responsibilities for the different aspects of risk management.

- Risk Activity: Responsibility
- Risk Identification: All project members
- Risk Registry: Project coordinator
- Risk Assessment: All project members
- Risk Response Options Identification: All project members
- Risk Contingency Planning: Project coordinator
- Risk Response Management: Project coordinator
- Risk Reporting: Project coordinator

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

13. Market Access, Risks and Barriers

The advantage of commercially available materials industry is that it uses almost the same types of machinery required for a successful geopolymerisation. If the material proves successful and exploitable, the production line required for a full-scale attempt will not require additional heavy machinery, but only precision devices and man-power (both technical and scientific). Nevertheless, the following risks and barriers have been identified and classified according to type, probability (low-medium-high) and impact severity (insignificant, low, medium, and high):

Technical risk:	The waste concrete and waste ceramics do not have always the same composition
Probability:	Low
Measure:	Innovative solution for the separation of CDW will be applied

Technical risk:	The material does not have comparable durability to commercially available materials
Probability:	Low (the geopolymers have been studied for the past 40-50 years. The literature proves that their properties are analogous or even better to those of the OPC)
Impact:	Low (alternative products can be explored if such issues arise)

Legislative barrier:	Façade material regulations do not cover binders from alternative materials.
Probability:	High (it is an EU-wide phenomenon, attributed to the conservatism of the construction industry)
Impact:	Medium - Low (there are workarounds for such cases: (a) mixing of the binder with a suitable amount of cement, so it falls under the regulation; (b) CE marking of the product and (c) European Technical Assessment certificate, which will secure unlimited use within the EU.

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation

Acknowledgements

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation Foundation (RIF).

The Project DEFEAT (INTEGRATED/0918/0052) has been co-funded by the European Regional Development Fund (ERDF) and the Cyprus Government, through the RESTART 2016-20 framework program of the Cyprus Research & Innovation.Foundation