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TM6. Environmental Projects Management

6.1 Environmental Projects Phases. Time and Cost Management in Environmental Projects
6.2.Resource management. Risk management
6.3. Good practice examples

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Topics

- Environmental Projects Management
- Environmental Projects Phases
- Time Management
- Cost Management

Environmental Projects

They are **series of activities** aimed at achieving **clearly specified environmental objectives** over **a defined period of time** and with **a limited budget**

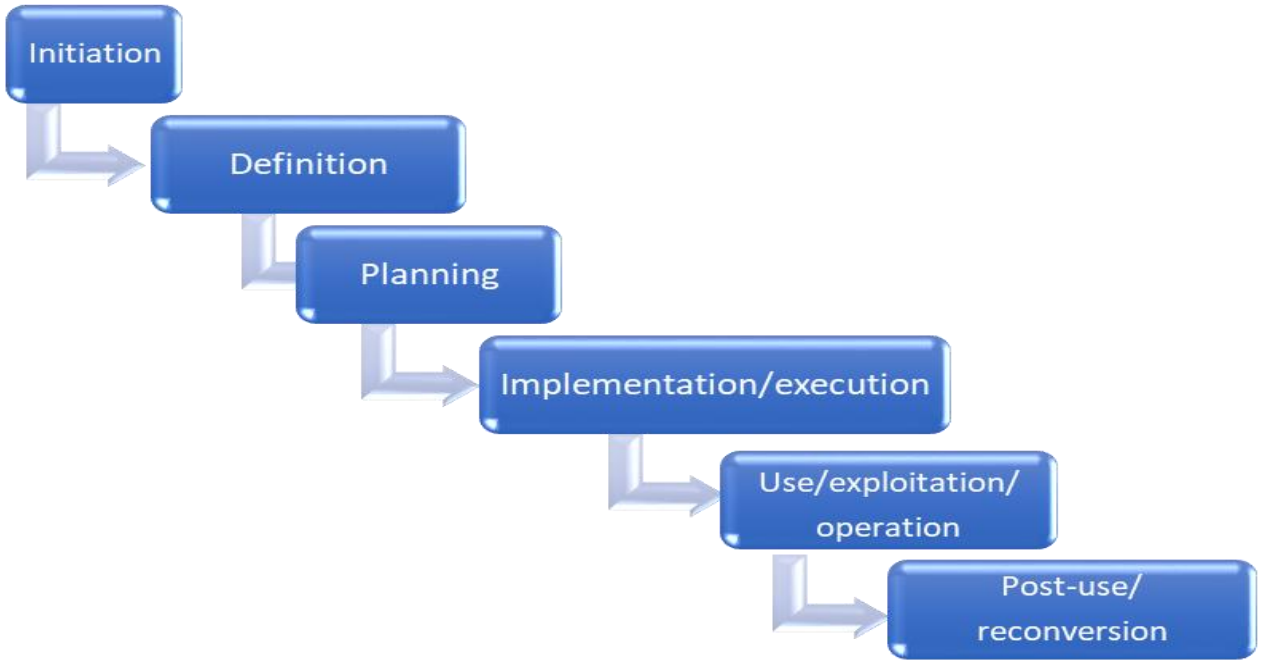
Environmental Projects Characteristics

- Their objectives are specific to the environment field
- Their results aim (at least partly) the sustainability issue
- They usually take place outside the organizations that undertake them
- They involve important changes both at the level of the organizations that implement them but also in the area where the results of the projects are obtained

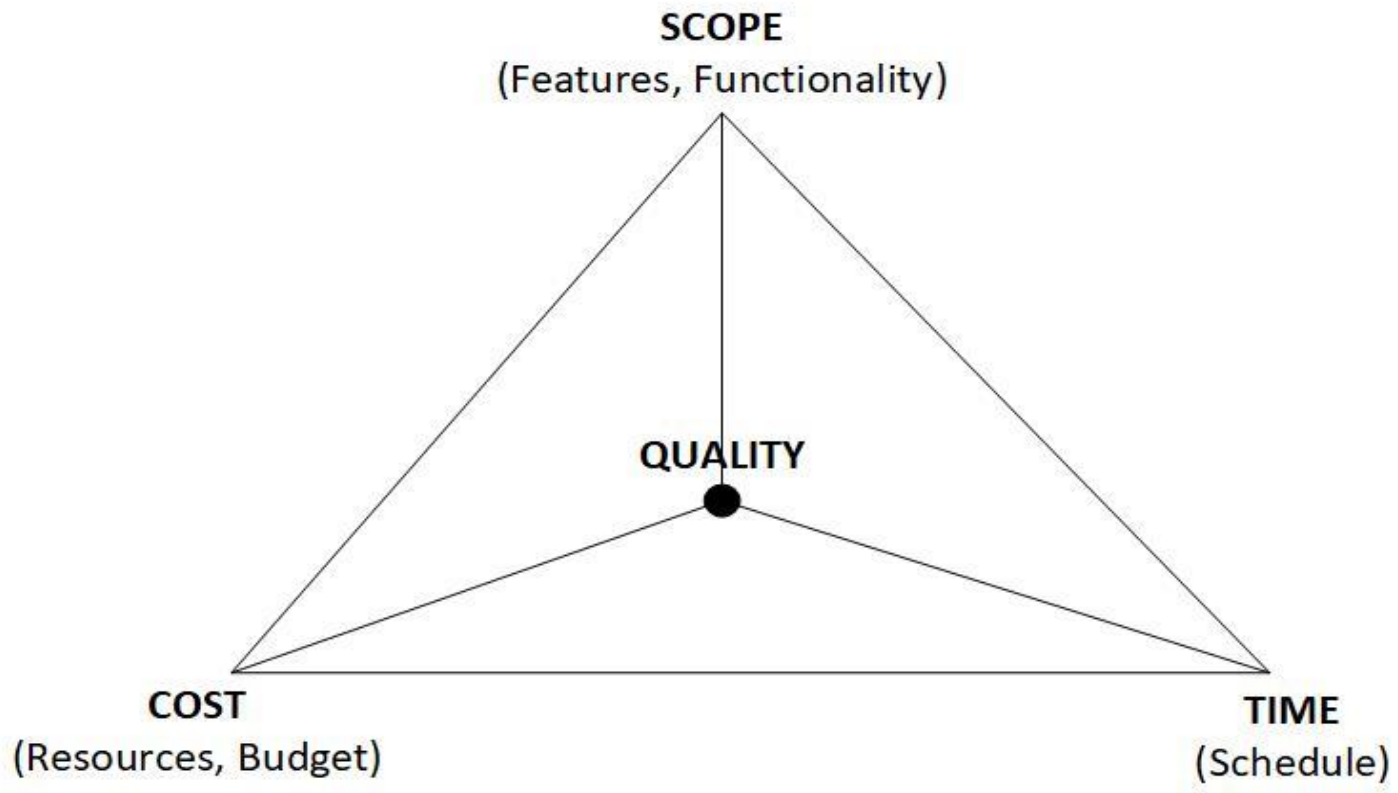
Environmental Projects Management

- Represents the use of project management principles, methods and processes to improve an element of the ecosystem (water, air, plants, soil or other living organisms) to achieve a sustainable outcome (Sholarin & Awange, 2015)
- It involves planning, organizing, coordinating and controlling the project from start to finish, in order to achieve the objectives and results in the field of environment according to the quality specifications, costs and deadlines assumed in relation to the client / funder of the project

Environmental Projects Phases



Triple constraint theory



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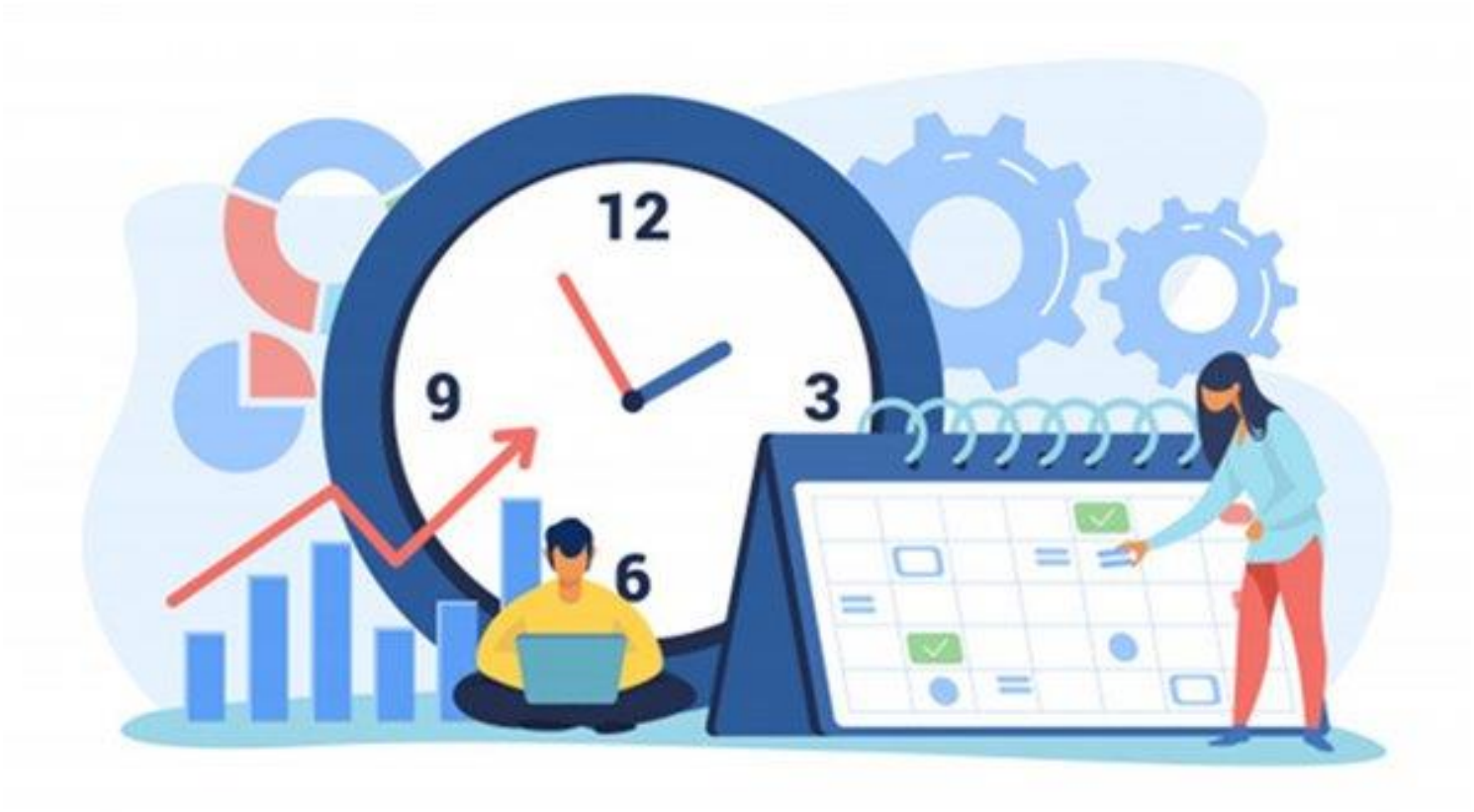
Environmental Projects Time Management



Time Management Processes

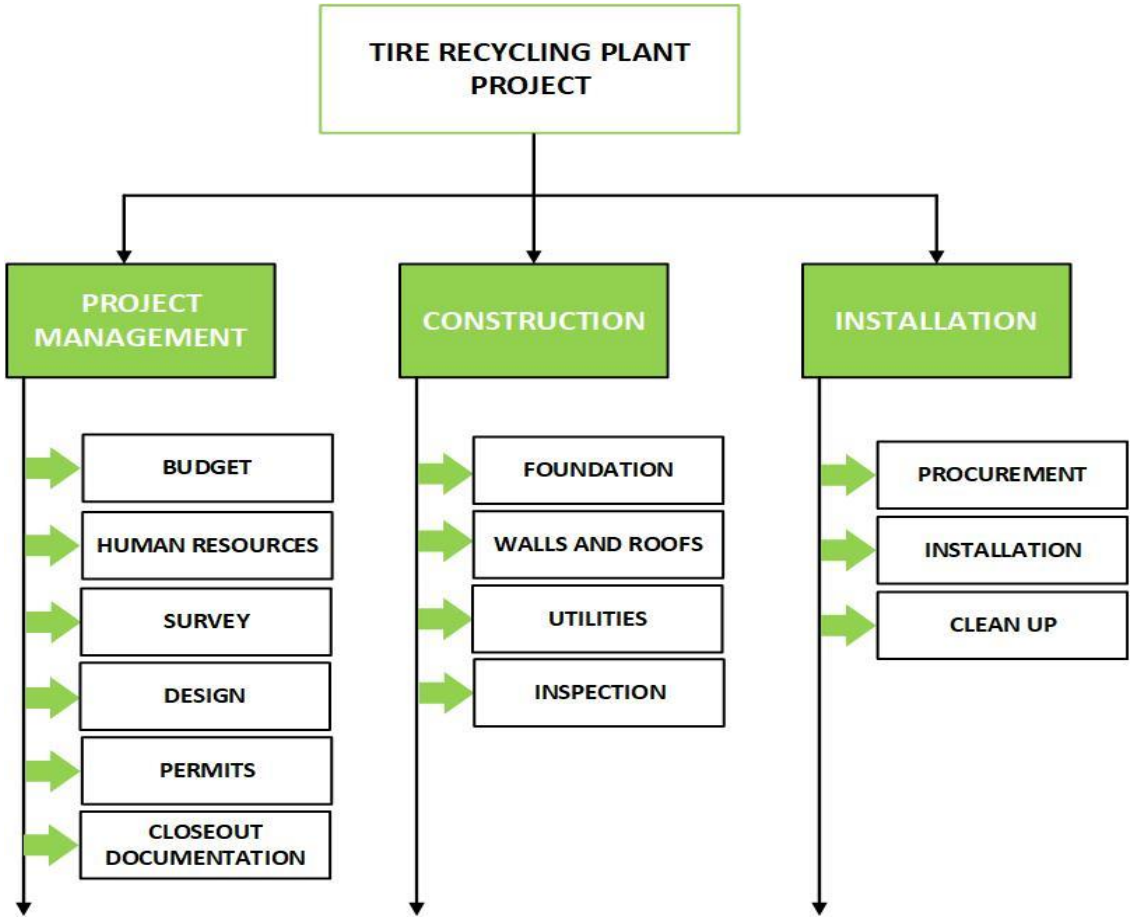
- Regarding time management for environmental projects, the processes that a project manager needs to go through in order to ensure the timely completion of the project are:
  - defining project activities/tasks;
  - sequencing the activities/tasks;
  - estimating the duration of activities/tasks;
  - developing the schedule for the project;
  - controlling the schedule for the project.

Defining Environmental Projects Tasks/Activities

- Defining environmental project activities involves identifying and documenting the specific activities that the project team needs to undertake in order to deliver the project scope.
- In order to be able to identify the activities in your project and build a project estimate regarding time and/or costs, you will need to build a **work breakdown structure** – or a **WBS**.

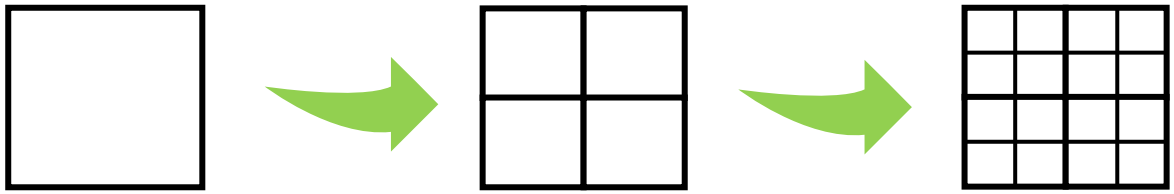
WBS

Definition: A work breakdown structure (WBS) is a logically structured hierarchical decomposition of the work to be executed by the project team in order to accomplish the project objectives (Haugan, 2002), (Project Management Institute, 2006).

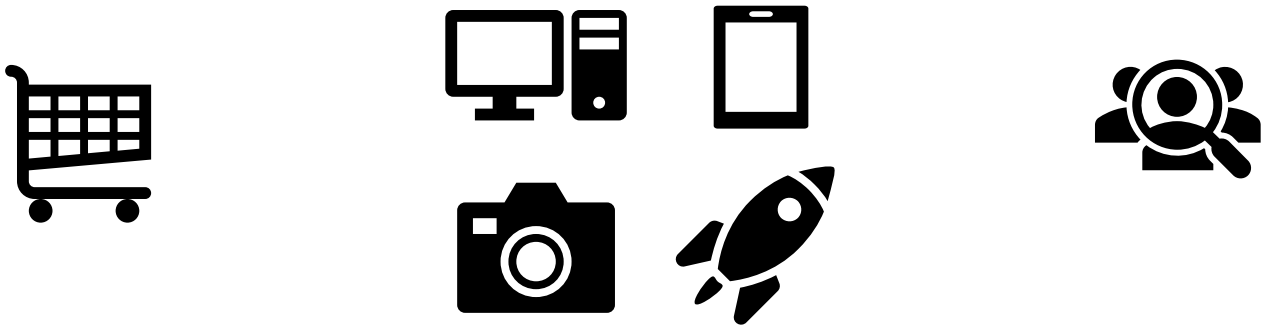


Steps for building a WBS

1. list the items in which the activity will split, in increasingly finer detail



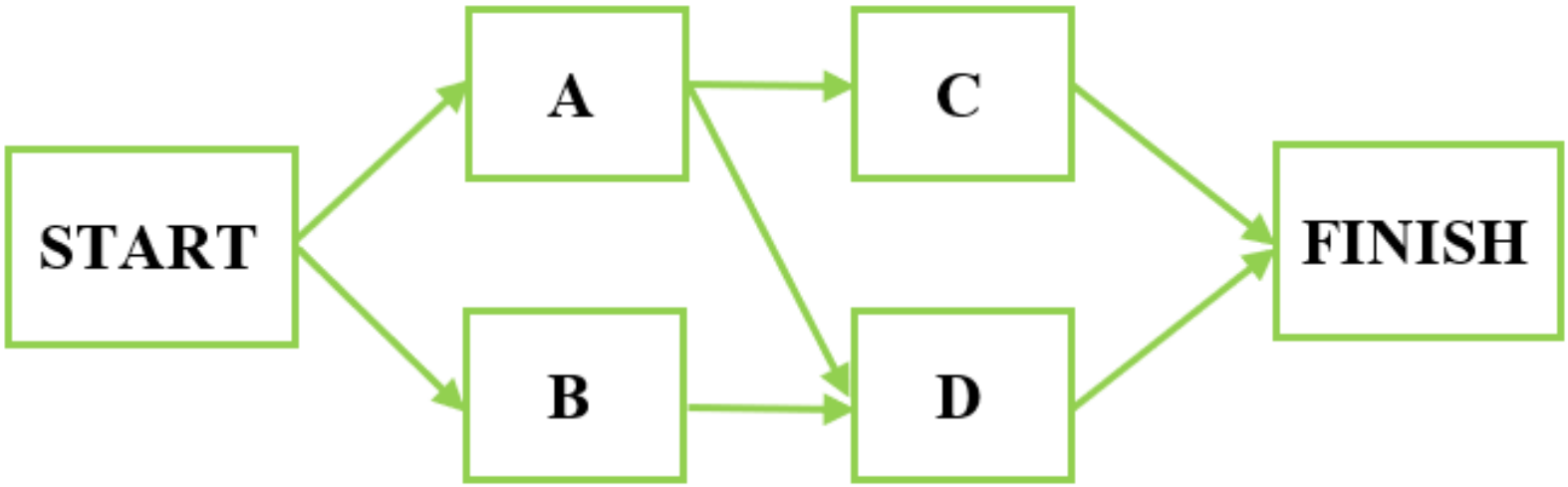
2. identify relevant data for WBS



Sequencing Environmental Projects Tasks/Activities

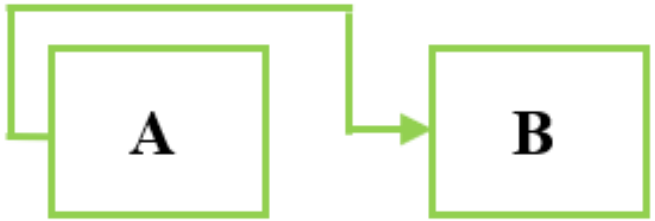
- Sequencing environmental projects activities involves identifying and documenting interdependencies among activities that the project team needs to undertake in order to deliver the project scope.
- A common method for constructing a sequence of project activities is the **precedence diagramming method** (Project Management Institute, 2013).

Sample Precedence Diagram



Precedence Relations Types

Finish-to-Start



Start-to-Start

Finish-to-Finish

Start-to-Finish

Estimating Environmental Projects Activities Duration

- Estimating environmental project activities duration involves assessing the time most likely needed to complete the activities the project team needs to undertake in order to deliver the project scope.
- In order to estimate project activities duration, one can resort to:
  - **expert judgement** (Project Management Institute, 2013);
  - **critical path method** (CPM);
  - **program evaluation and review technique** (PERT).

Estimating Activities Duration with CPM

The calculation of the **activity duration** is performed deterministically in the case of the CPM method using the formula:

$$d_i = \frac{Q_i}{PN_i \text{ x } p_i \text{ x } \mathrm{W_i}}$$

Estimating Activities Duration with PERT

- The PERT technique uses an estimate of activity duration calculated as a weighted average of three elements:
  - pessimistic duration of the activity (P);
  - most likely duration of the activity (M);
  - optimistic duration of the activity (O).
- The formula used to calculate the estimated activity duration is:
  - **estimated activity duration = (P + 4 x M + O) / 6**

Estimating Activities Duration with PERT

- We use the *standard deviation* from the mean to calculate the chances of finishing the activity in the estimated duration. This standard deviation has a specific formula for PERT:
  - **σ = (P – O)/6**
- **The probability that the duration of the activity is in the [estimated duration of the activity – *n* standard deviations; estimated duration of the activity + *n* standard deviations] is**:
  - ***n*** = one standard deviation → 68%;
  - ***n*** = two standard deviations → 95%;
  - ***n*** = three standard deviations → 99,7%;
  - ***n*** = six standard deviations → 99,9%.

Exercise

Determine using the PERT and the data in the table below the estimated duration of the activities in an environmental project related to the establishment of a domestic wastewater treatment plant undertaken by Scînteiești commune from Galați county, Romania. What is the time interval in which we can estimate that these activities will be completed using a 95% probability?

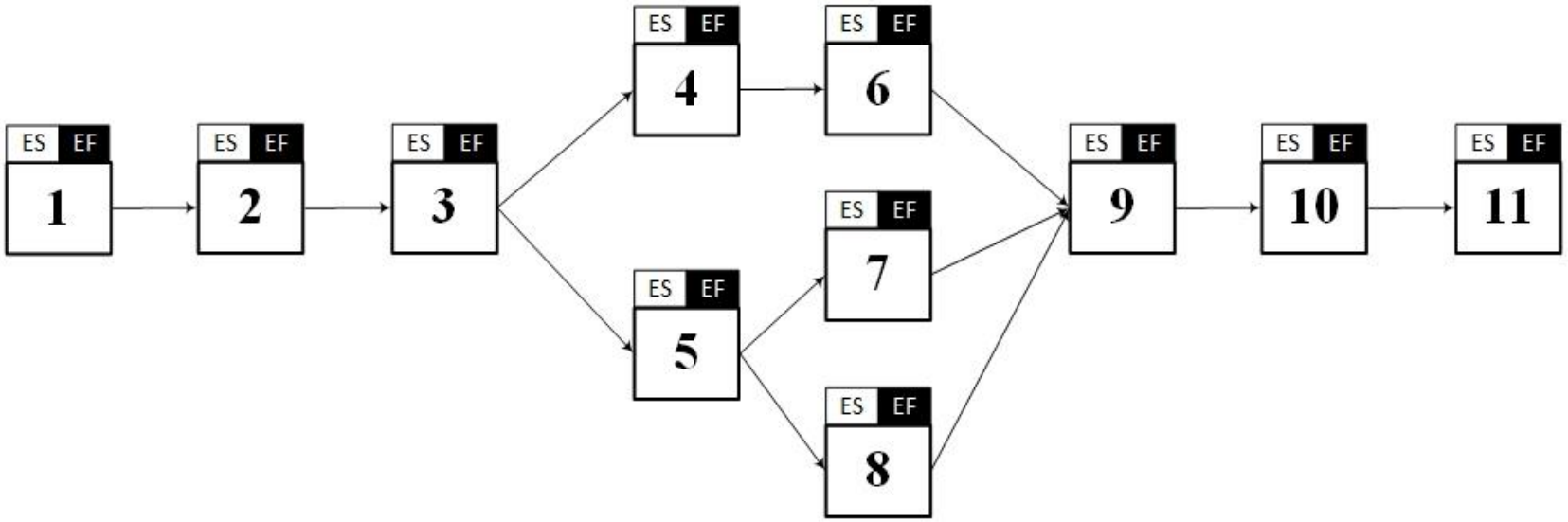
Activity	Pessimistic duration	Optimistic duration	Most likely duration
Documentation for obtaining permits	60 days	30 days	36 days
Installation of the wastewater treatment plant	24 days	10 days	15 days
Installation of a pumping station	4 days	2 days	3 days
Construction of a 15 km collector	14 days	8 days	10 days
Construction of a protective dam	7 days	4 days	3 days

Solution

Activity	Estimated duration	Standard deviation	Interval (95%)
Documentation for obtaining permits	(60 + 4 x 36 + 30)/6 = 39 days	(60 – 30)/6 = 5 days	[39-2x5 ; 39+2x5] = [29 ; 49]
Installation of the wastewater treatment plant	(24 + 4 x 15 + 10)/6 = 15,66 days	(24 – 10)/6 = 2,33 days	[15,66-2x2,33 ; 15,66+2x2,33] = [11 ; 20,33]
Installation of a pumping station	(4 + 4 x 3 + 2)/6 = 3 days	(4 – 2)/6 = 0,33 days	[3-2x0,33 ; 3+2x0,33] = [2,33 ; 3,66]
Construction of a 15 km collector	(14 + 4 x 10 + 8)/6 = 10,33 days	(14 – 8)/6 = 1 zi	[10,33-2x1 ; 10,33+2x1] = [8,33 ; 12,33]
Construction of a protective dam	(7 + 4 x 4 + 3)/6 = 4,33 days	(7 – 3)/6 = 0,66 days	[4,33-2x0,66 ; 4,33+2x0,66] = [3 ; 5,66]

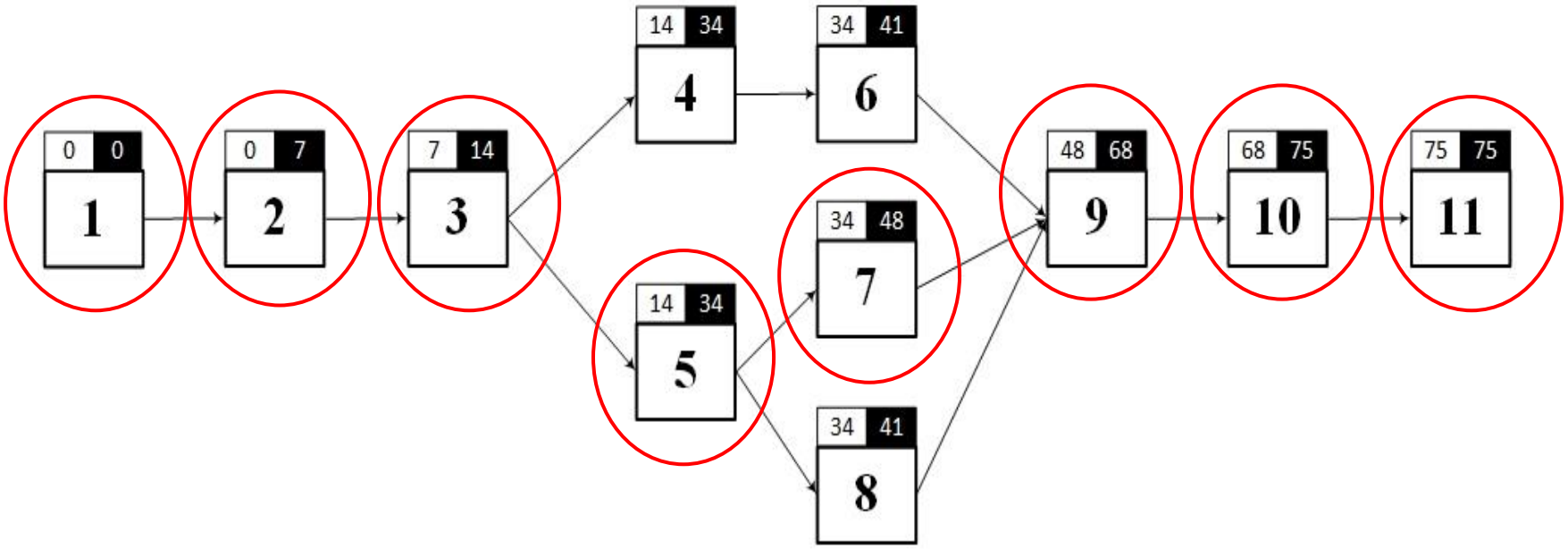
Network Diagram

- **Earliest Start Time (ES);**
- **Latest Start Time (LS);**
- **Earliest Finish Time (EF);**
- **Latest Finish Time (LF);**
- **Float;**
- **Path.**

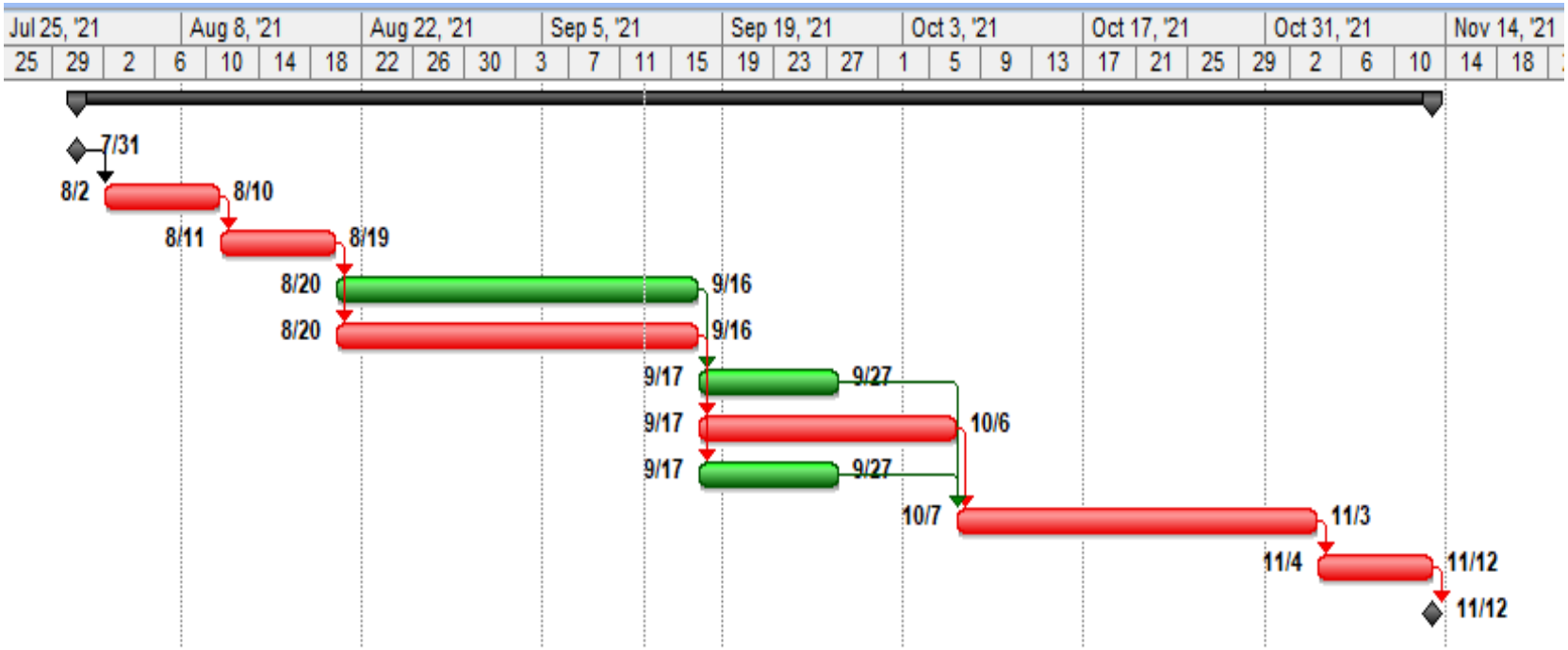


Network Diagram

The critical path in a network diagram is the path with the longest duration, obtained as the sum of the durations of individual activities between the start point and the end point of the network diagram.



Gantt Chart


Jul 25, '21
Aug 8, '21
Aug 22, '21
Sep 5, '21
Sep 19, '21
Oct 3, '21
Oct 17, '21
Oct 31, '21
Nov 14, '21
25 29 2 6 10 14 18 22 26 30 3 7 11 15 19 23 27 1 5 9 13 17 21 25 29 2 6 10 14 18
7/31
8/2
8/10
8/11
8/19
8/20
9/16
8/20
9/16
9/17
9/27
9/17
10/6
9/17
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11/3
11/4
11/12
11/12

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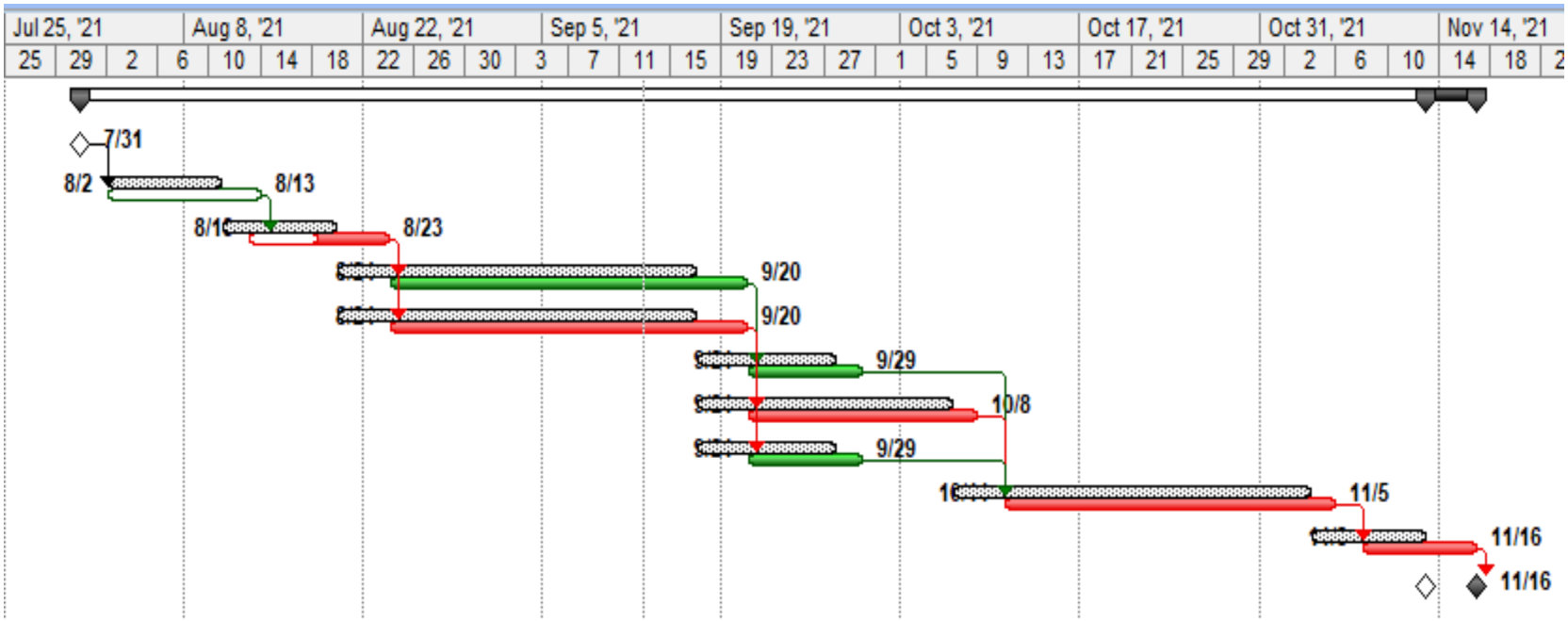
Controlling Environmental Projects Schedule



Controlling Environmental Projects Schedule

- Once we realize we have a problem in terms of schedule, the project management team has a couple of options to take control of the project schedule and bring it back on track:
  - *Fast Tracking;*
  - *Crashing*.

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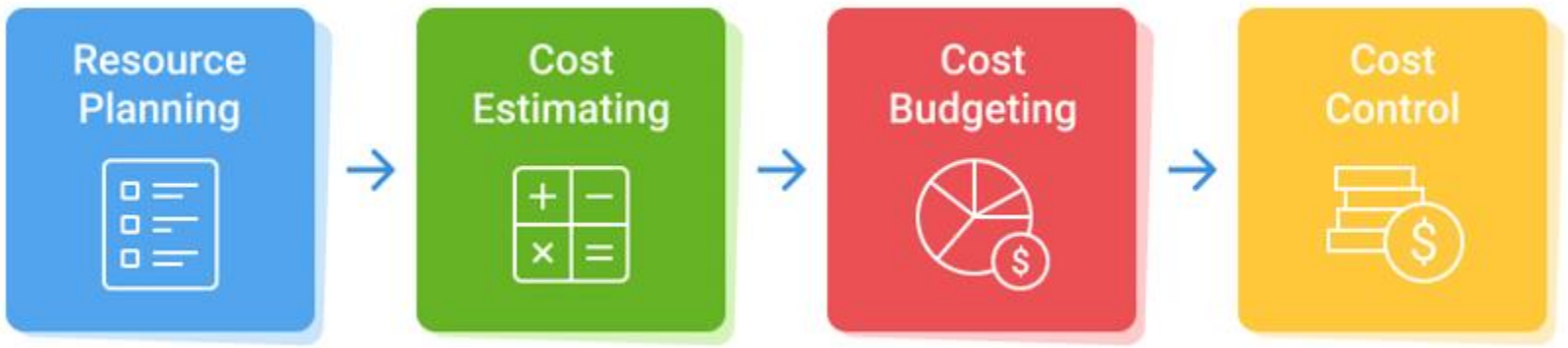
Environmental Projects Cost Management

Environmental Projects Cost Management Phases



Environmental Project Resource Planning

- Estimating a project's time and effort also forms the basis for the project's budget.
- In order to be able to identify an environmental project's **costs**, first one needs to fully determine the **resources** needed to undertake it:
  - **Human Resources;** 
  - **Material Resources;** 
  - **Equipment**.   

Environmental Project Cost Estimating

- ***All the resources identified generate costs*** which depend on their **standard rates** and the **quantity of work** they are needed for. So, after identifying all the resources required for completing the environmental project, **cost estimating** is performed as:
  - **analogous estimating** (or top-down estimating);
  - **bottom-up estimating.**

Example

Imagine that writing the feasibility study for your environmental project requires the participation of a consultant and an engineer from the project team. You set the duration of the "writing feasibility study" activity to 7 days based on the opinion of experts (when we talk about "days" in a project, we are actually referring to "standard working days", so we take into account a duration of 8 hours of actual work per day). The standard rates are 200 RON/hour for the consultant and 50 RON/hour for the engineer.

So, the cost of the activity "writing the feasibility study" will be calculated as follows:

(200 RON/hour x 8 hours/day x 7 days) + (50 RON/hour x 8 hours/day x 7 days) = 14,000 RON

Environmental Project Cost Budgeting

- Cost budgeting involves allocating the overall cost estimates to individual work packages of the project. A cost baseline is established to be later used in measuring project performance, and it usually takes the form of a **project budget**.

Simple Project Budget

Activity ID	Activity	Cost
1	Initiation	0 €
2	Staffing	200 €
3	Planning	500 €
4	Carrying out the procurement procedure for composting containers and composting facilities	3,500 €
5	Carrying out the procurement procedure for teachers/pupils training services - teachers/pupils workshops and practical workshops	2,800 €
6	Installation of the compost bins	2,500 €
7	Carrying out the training workshops for teachers	2,500 €
8	Carrying out the practical workshops for pupils	1,000 €
9	Monitoring the composting process	1,000 €
10	Closeout documentation	500 €
11	Hand over	0 €
TOTAL		**14,500 €**

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More Complex Project Budget

EXPENDITURE CATEGORY (1)	DESCRIPTION (2)	MEASURING UNIT (3)	STANDARD RATE (4)	NUMBER OF UNITS (5)	TOTAL COSTS (6 = 4*5)	OWN FUNDING (7)	CO-FINANCING (8)
Labor costs	Team member 1	€ / hour	100 € / hour	10	1,000	%	%
	Consultant	€ / hour	200 € / hour	10	2,000	%	%
	…	…	…	…	…	%	%
Equipment costs	Equipment 1	€ / hour	150 € / hour	20	3,000	%	%
	Equipment 2	€ / hour	80 € / hour	100	8,000	%	%
	…	…	…	…	…	%	%
Materials costs	Material 1	€ / unit	2 € / unit	50	100	%	%
	Material 2	€ / kg	5 € / kg	100	500	%	%
	…	…	…	…	…	%	%
Accommodation costs	…	€				%	%
Transportation costs	…	€				%	%
Outsourcing costs	…	€				%	%
Overhead costs	…	€				%	%
GRAND TOTAL							

Environmental Project Cost Control

- Projects should not exceed their budgets in order to use resources as efficiently as possible.
- Paying attention to how the time spent stacks up against your estimate helps you keep project costs in check.
- Methods for cost control include **cash-flow analysis** and **earned value**.

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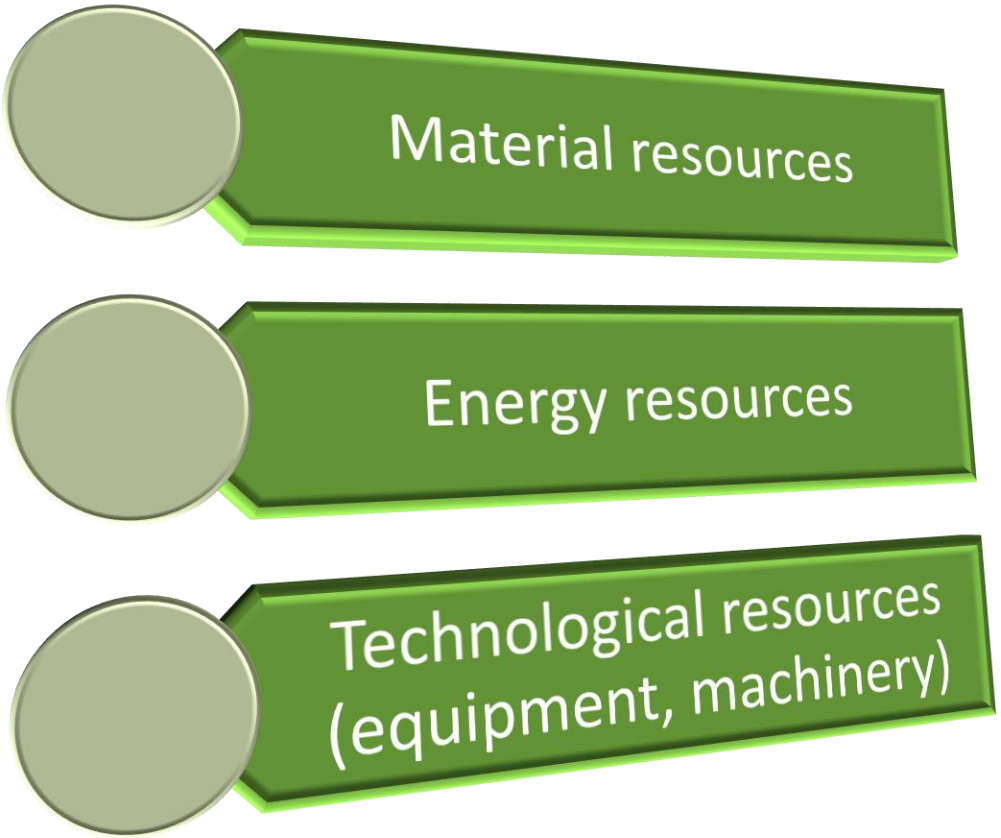
Sample Cash-Flow Report

	7/25/21	8/1/21	8/8/21	8/15/21	8/22/21	8/29/21	9/5/21	9/12/21	9/
COMPOSTING PROJECT									
Initiation									
Staffing		100.00 €	100.00 €						
Planning			71.43 €	357.14 €	71.43 €				
Bins Procurement					700.00 €	875.00 €	875.00 €	875.00 €	
Training Procurement					560.00 €	700.00 €	700.00 €	700.00 €	
Bins Installation									
Teachers Training									
Pupils Training									
Monitoring the composting process									
Closeout documentation									
Hand over									
Total		100.00 €	171.43 €	357.14 €	1,331.43 €	1,575.00 €	1,575.00 €	1,575.00 €	

Earned Value Report

Task Name	Planned Value - PV (BCWS)	Earned Value - EV (BCWP)	AC (ACWP)	SV	CV	EAC	BAC	VAC
COMPOSTING PROJECT	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**	**$0.00**
Initiation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Staffing	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Planning	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Bins Procurement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Training Procurement	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Bins Installation	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Teachers Training	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Pupils Training	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Monitoring the compo	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Closeout documentati	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00
Hand over	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00	$0.00

Unit 6.2.Resource management. Risk management



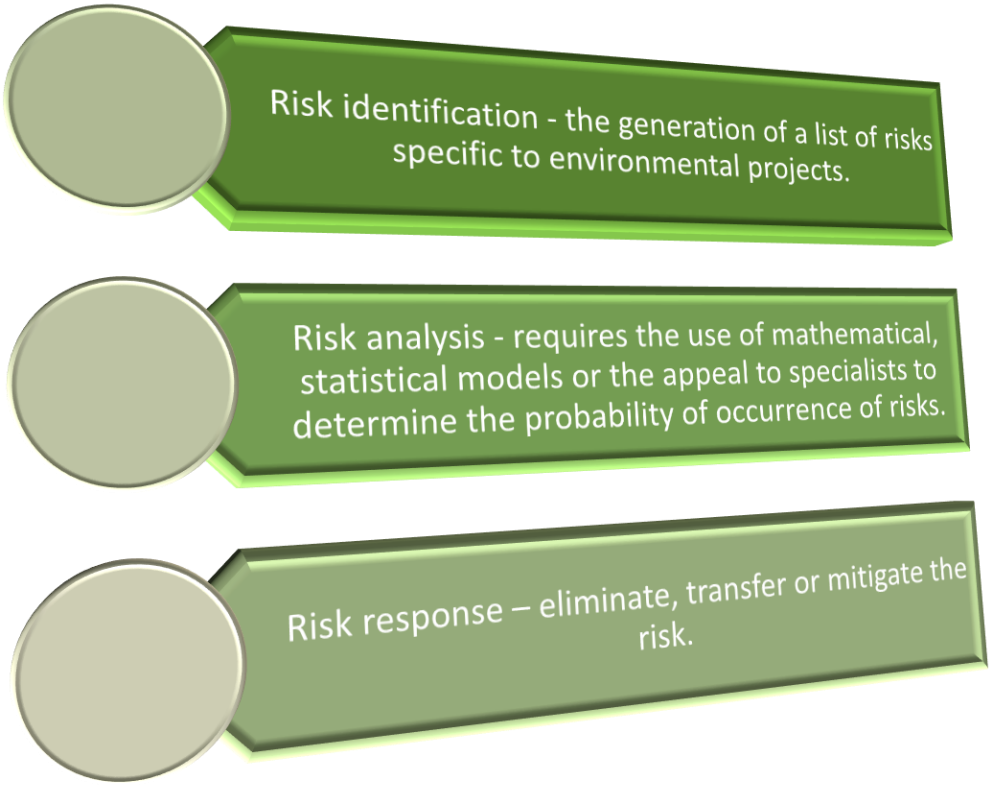
List of resources in the MS Project for the recycling project (Ghimbav, Brasov)

Resource Name	Type	Material Label	Initials	Group	Max. Units	Std. Rate	Ovt. Rate	Cost/Use
Insula ecologica subterana K 10	Work		I		1	$0.00/hr	$0.00/hr	$0.00
Ecolbell 3 mc	Work		E		3	$0.00/hr	$0.00/hr	$0.00
Compostainere 310l	Work		C		700	$0.00/hr	$0.00/hr	$0.00
Pubele 120l	Work		P		700	$0.00/hr	$0.00/hr	$0.00
Compactor K Solar 10 mc	Work		C		4	$0.00/hr	$0.00/hr	$0.00
Clopot IGLUS 3mc	Work		C		15	$0.00/hr	$0.00/hr	$0.00
Consultant	Work		C		2	$0.00/hr	$0.00/hr	$0.00
Manager proiect	Work		M		1	$0.00/hr	$0.00/hr	$0.00
Proiectant	Work		P		1	$0.00/hr	$0.00/hr	$0.00
Muncitor	Work		M		5	$0.00/hr	$0.00/hr	$0.00

Resource usage schedule in MS Project for recycling project

Resource Name	Work	Details	Jan 23, '22 T	F	S	S
Pregatire personal exploatare	*112 hrs*	Work				
Documentație finală	*56 hrs*	Work				
Manager proiect	**1,176 hrs**	Work	16h	16h		
Documentație	*160 hrs*	Work				
Terenuri	*320 hrs*	Work				
Contractare utilaje și echipamente	*112 hrs*	Work				
Alimentare cu apă	*56 hrs*	Work				
Lucrari constructii	*160 hrs*	Work				
Instalații electrice	*96 hrs*	Work	8h	8h		
Instalare utilaje tehnologice	*160 hrs*	Work	8h	8h		
Pregatire personal exploatare	*112 hrs*	Work				
Proiectant	216 hrs	Work				
Documentație	*160 hrs*	Work				
Documentație finală	*56 hrs*	Work				
Muncitor	**1,888 hrs**	Work	64h	64h		
Lucrari constructii	*800 hrs*	Work				
Instalații electrice	*288 hrs*	Work	24h	24h		
Instalare utilaje tehnologice	*800 hrs*	Work	40h	40h		

Risk management



Risk index

Unit 6.3. Good practice examples

- Project regarding the construction of a solar power plant in Avram Iancu commune;
- Ecological reconstruction project through afforestation of degraded agricultural lands in Fălciu commune, Vaslui county;
- Sewerage and treatment plant in Hulubești commune, Dâmbovița county;

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THANK YOU FOR YOUR ATTENTION!

ANY QUESTIONS?

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