

## SCHOOL RECONSTRUCTION AFTER HURRICANE IN JAMAICA



### PROJECT MANAGEMENT

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FULL REPORT: Including the descriptions of the previous relevant parts of assignments

## PROJECT DESCRIPTION

Schools are one of the most important locations in the actual society.

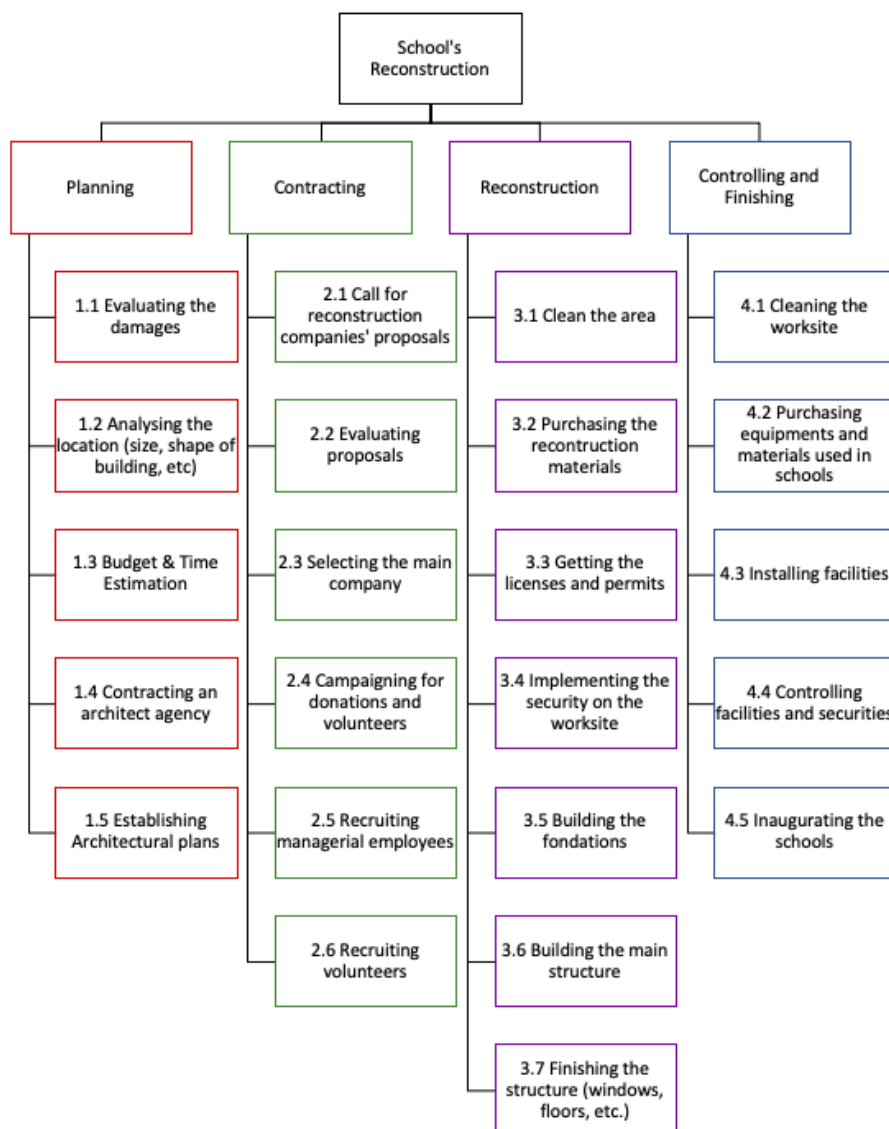
In this project, we assume that we must reconstruct a school after a hurricane. Therefore, not only the reconstruction is important, but we should also focus on reconstructing the school in a way that avoids future disasters.

Important facts about our project:

- Only High schools are being reconstructed
- We need to find volunteers and funding to support the project
- We are asking the universities to research about Hurricane-proof construction
- We are constructing the schools from scratch

## ASSIGNMENT 1

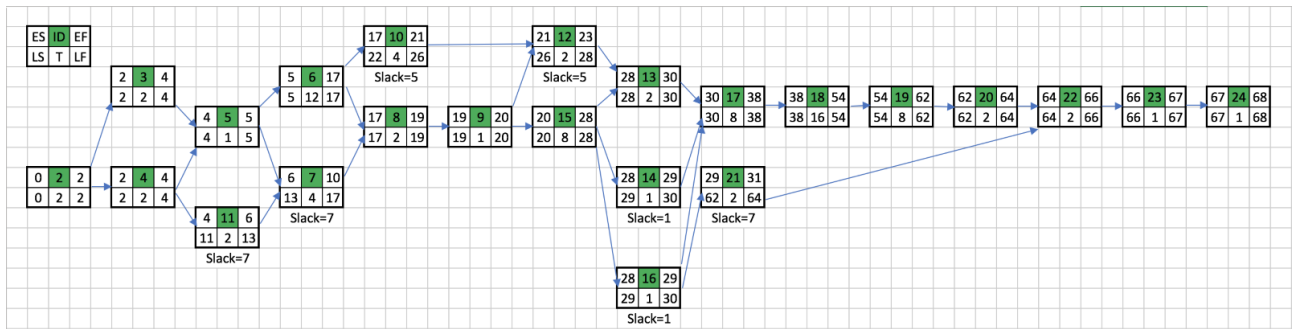
## WBS DESIGN



## TABLE OF THE TASKS

ID	WBS	TASKS	PREDECESSOR	DURATION (weeks)
1	1	Kick-off the project		0
2	1.1	Evaluating the damages		2
3	1.2	Analyzing the location (size, shape of building, etc)	2	2
4	1.3	Budget & Time Estimation	2	2
5	1.4	Contracting an architect agency	3,4	1
6	1.5	Establishing Architectural plans	5	12
7	2.1	Call for reconstruction companies' proposals	5, 11	4
8	2.2	Evaluating proposals	6,7	2
9	2.3	Selecting the main company	8	1
10	2.4	Campaigning for donations and volunteers	6	4
11	2.5	Recruiting managerial employees	4	2
12	2.6	Recruiting volunteers	9,10	2
13	3.1	Clean the area	12, 15	2
14	3.2	Purchasing the reconstruction materials	15	1
15	3.3	Getting the licenses and permits	9	8
16	3.4	Implementing the security on the worksite	15	1
17	3.5	Building the foundations	13, 14, 16	8
18	3.6	Building the main structure	17	16
19	3.7	Finishing the structure (windows, floors, etc.)	18	8
20	4.1	Cleaning the worksite	19	2
21	4.2	Purchasing equipment and materials used in schools	16	2
22	4.3	Installing facilities	20,21	2
23	4.4	Controlling facilities and securities	22	1
24	4.5	Inaugurating the schools	23	1

## CPM



## CRITICAL PATHS

- Critical path 1: 2,4,5,6,8,9,15,13,17,18,19,20,22,23,24
- Critical path 2: 2,3,5,6,8,9,15,13,17,18,19,20,22,23,24

## ASSIGNMENT 2

### DPM (CPM without interactions)

Element Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Element 1	1	1																						
Element 2		2	1	2																				
Element 3			3	1	3																			
Element 4				4	1	4																		
Element 5					5	1	5																	
Element 6						6	1	6																
Element 7							7	1			1													
Element 8								8	1	1														
Element 9									9	1														
Element 10										10														
Element 11											11													
Element 12												12												
Element 13													13		1									
Element 14														14	1									
Element 15															15									
Element 16																16								
Element 17																	17							
Element 18																		18						
Element 19																			19					
Element 20																				20				
Element 21																					21			
Element 22																						22		
Element 23																							23	
Element 24																								24

Note: We created the matrix based on the first table of task provided before, to avoid any misunderstanding and inconsistencies, however, in our first assignment, activity number 11 comes before 7 and activity number 15 comes before 14,15, hence making our matrix look like it has loops, but it does not.

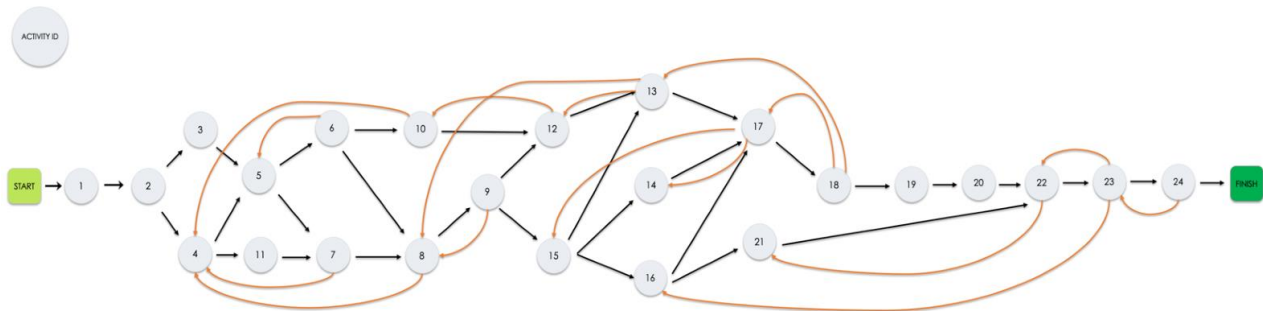
## LOOPS DESCRIPTIONS

1. Another hurricane comes after analyzing the location: **3-> 2**
2. The proposed architecture plan does not meet our expectations: **6->5**
3. Found an interesting proposal that cost more than the budget, need to re-estimate the budget: **7 -> 4**
4. Reconstruction companies cost more than expected: **8 -> 4**
5. Something went wrong after the main company selection, so selection of a new company: 9 -> 8
6. We don't have enough volunteers, so we are campaigning again: **12 -> 10**
7. Need of more volunteers to clean the area :**13 -> 12**
8. We miss a permit or there are new regulations: **17 -> 15**
9. Not enough materials to finish the construction: **17 -> 14**
10. There are problems with the structure: **18 -> 17**
11. Accident on the workplace (roof or floor broken) : **18 -> 13**
12. We find that we should purchase more equipment: **22 -> 21**
13. Problems while we control the facilities :**23 -> 22**
14. Vandalization or crimes against the installation and need to reinforce the security: **23 -> 16**
15. We finish in May and school opens in august so we must control again: **24->23**

## CPM (with loops)

CPM With New Iterations

Black lines represent the original CPM, and Orange lines represent the new iterations.



## DPM (with loops)

Element Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Element 1	1	1																						
Element 2	2	1	2	1																				
Element 3	3		1	3																				
Element 4	4		1		4		1	1																
Element 5	5			1	1	5	1																	
Element 6	6					1	6																	
Element 7	7				1		7			1														
Element 8	8					1	1	8	1															
Element 9	9							1	9															
Element 10	10					1				10		1												
Element 11	11			1							11													
Element 12	12							1	1		12	1												
Element 13	13									1	13		1		1			1						
Element 14	14											14	1		1									
Element 15	15						1						15		1									
Element 16	16												1	16									1	
Element 17	17										1	1			1	17	1							
Element 18	18														1	18								
Element 19	19															1	19							
Element 20	20																1	20						
Element 21	21														1				21	1				
Element 22	22																1	1	22	1				
Element 23	23																			1	23	1		
Element 24	24																					1	24	

## DEPENDENCY REPORT

Element Full Name	Depends on
Kick-off the project	
Evaluating the damages	Kick-off the project , Analyzing the location (size, shape of building, etc) ,
Analyzing the location (size, shape of building)	Evaluating the damages ,
Budget & Time Estimation	Evaluating the damages , Call for reconstruction companies' proposals , Evaluating proposals ,
Contracting an architect agency	Analyzing the location (size, shape of building, etc) , Budget & Time Estimation , Establishing Architectural plans ,
Establishing Architectural plans	Contracting an architect agency ,
Call for reconstruction companies' proposals	Contracting an architect agency , Recruiting managerial employees ,
Evaluating proposals	Establishing Architectural plans , Call for reconstruction companies' proposals , Selecting the main company ,
Selecting the main company	Evaluating proposals ,
Campaigning for donations and volunteers	Establishing Architectural plans , Recruiting volunteers ,
Recruiting managerial employees	Budget & Time Estimation ,
Recruiting volunteers	Selecting the main company , Campaigning for donations and volunteers , Clean the area ,
Clean the area	Recruiting volunteers , Getting the licenses and permits , Building the main structure ,
Purchasing the reconstruction materials	Getting the licenses and permits , Building the foundations ,
Getting the licenses and permits	Selecting the main company , Building the foundations ,
Implementing the security on the worksite	Getting the licenses and permits , Controlling facilities and securities ,
Building the foundations	Clean the area , Purchasing the reconstruction materials , Implementing the security on the worksite , Building the main structure ,
Building the main structure	Building the foundations ,
Finishing the structure (windows, floors, etc.)	Building the main structure ,
Cleaning the worksite	Finishing the structure (windows, floors, etc.) ,
Purchasing equipment and materials used in schools	Implementing the security on the worksite , Installing facilities ,
Installing facilities	Cleaning the worksite , Purchasing equipment and materials used in schools , Controlling facilities and securities ,
Controlling facilities and securities	Installing facilities , Inaugurating the schools ,
Inaugurating the schools	Controlling facilities and securities ,

## SEQUENCES (red square)

PARTITIONED DSM		Element 1	Element 2	Element 3	Element 4	Element 7	Element 5	Element 6	Element 8	Element 9	Element 11	Element 10	Element 12	Element 13	Element 15	Element 17	Element 14	Element 16	Element 18	Element 23	Element 22	Element 20	Element 19	Element 21	Element 24
		1	2	3	4	7	5	6	8	9	11	10	12	13	15	17	14	16	18	23	22	20	19	21	24
Element 1	1	1																							
Element 2	2	1	2	1																					
Element 3	3		1	3																					
Element 4	4		1		4	1			1																
Element 7	7					7	1				1														
Element 5	5			1	1		5	1																	
Element 6	6						1	6																	
Element 8	8					1		1	8	1															
Element 9	9								1	9															
Element 11	11				1						11														
Element 10	10							1				10	1												
Element 12	12									1		1	12	1											
Element 13	13											1	13	1					1						
Element 15	15									1				15	1										
Element 17	17												1		17	1	1	1							
Element 14	14													1	1	14									
Element 16	16														1			16		1					
Element 18	18															1			18						
Element 23	23																			23	1				1
Element 22	22																			1	22	1		1	
Element 20	20																					20	1		
Element 19	19																		1				19		
Element 21	21																	1		1				21	
Element 24	24																			1					24

## COUPLED TASKS



PARTITIONED DSM																								
	Element 1	Element 2	Element 3	Element 4	Element 7	Element 5	Element 6	Element 8	Element 9	Element 11	Element 10	Element 12	Element 13	Element 15	Element 17	Element 14	Element 16	Element 18	Element 23	Element 22	Element 20	Element 19	Element 21	Element 24
	1	2	3	4	7	5	6	8	9	11	10	12	13	15	17	14	16	18	23	22	20	19	21	24
Element 1	1	1																						
Element 2	2	1	2	1																				
Element 3	3		1	3																				
Element 4	4		1		4	1		1																
Element 7	7				7	1				1														
Element 5	5			1	1		5	1																
Element 6	6						1	6																
Element 8	8					1		1	8	1														
Element 9	9								1	9														
Element 11	11			1						11														
Element 10	10						1				10	1												
Element 12	12								1		1	12	1											
Element 13	13										1	13	1					1						
Element 15	15								1				15	1										
Element 17	17												1	17	1	1	1							
Element 14	14												1	1	14									
Element 16	16												1			16		1						
Element 18	18																18							
Element 23	23																	23	1				1	
Element 22	22																		1	22	1		1	
Element 20	20																				20	1		
Element 19	19																	1				19		
Element 21	21																			1			21	
Element 24	24																				1			24

## META-TASKS

PARTITIONED DSM																								
	Element 1	Element 2	Element 3	Element 4	Element 7	Element 5	Element 6	Element 8	Element 9	Element 11	Element 10	Element 12	Element 13	Element 15	Element 17	Element 14	Element 16	Element 18	Element 23	Element 22	Element 20	Element 19	Element 21	Element 24
	1	2	3	4	7	5	6	8	9	11	10	12	13	15	17	14	16	18	23	22	20	19	21	24
Element 1	1	1																						
Element 2	2	1	2	1																				
Element 3	3		1	3																				
Element 4	4		1		4	1		1																
Element 7	7				7	1				1														
Element 5	5			1	1		5	1																
Element 6	6						1	6																
Element 8	8					1		1	8	1														
Element 9	9								1	9														
Element 11	11			1						11														
Element 10	10						1				10	1												
Element 12	12								1		1	12	1											
Element 13	13												13	1				1						
Element 15	15												1	15	1									
Element 17	17												1	1	17	1	1	1						
Element 14	14												1	1	14									
Element 16	16												1			16		1						
Element 18	18																18							
Element 23	23																	23	1				1	
Element 22	22																		1	22	1		1	
Element 20	20																				20	1		
Element 19	19																	1				19		
Element 21	21																			1			21	
Element 24	24																				1			24

Meta task #1

Metatask#2.

Metatask#3

Meta task#1: Preparation

Meta task#2: Construction

Meta task#3: Installation

## ASSIGNMENT 3



## PROJECT CRASHING

ID	WBS	TASKS	PREDECESSOR	DURATION (weeks)	MAX REDUCED CRASHING	WEEKS BY	CRASHING COST/WEEK (\$)
1	1	Kick-off the project		0	0		50
2	1.1	Evaluating the damages		2	0,5		500
3	1.2	Analyzing the location (size, shape of building, etc)	2	2	0		500
4	1.3	Budget & Time Estimation	2	2	0		200
5	1.4	Contracting an architect agency	3,4	1	0		500
6	1.5	Establishing Architectural plans	5	12	4		1000
7	2.1	Call for reconstruction companies' proposals	5, 11	4	1		300
8	2.2	Evaluating proposals	6,7	2	1		300
9	2.3	Selecting the main company	8	1	0		15
10	2.4	Campaigning for donations and volunteers	6	4	1		500
11	2.5	Recruiting managerial employees	4	2	0,5		500
12	2.6	Recruiting volunteers	9,10	2	0		50
13	3.1	Clean the area	12, 15	2	1		1000
14	3.2	Purchasing the reconstruction materials	15	1	0		9000
15	3.3	Getting the licenses and permits	9	8	4		600
16	3.4	Implementing the security on the worksite	15	1	0		700
17	3.5	Building the foundations	13, 14, 16	8	2		2000
18	3.6	Building the main structure	17	16	4		3000
19	3.7	Finishing the structure (windows, floors, etc.)	18	8	2		2500
20	4.1	Cleaning the worksite	19	2	0		800
21	4.2	Purchasing equipment and materials used in schools	16	2	1		700
22	4.3	Installing facilities	20,21	2	0,5		500
23	4.4	Controlling facilities and securities	22	1	0		3000
24	4.5	Inaugurating the schools	23	1	0		1000

ID	MAX REDUCED CRASHING	WEEKS BY	CRASHING COST/WEEK (\$)	EXPLANATION
1	0		50	
2	0,5		500	It is possible that the damages occurred are less important than expected and quicker to estimate
3	0		500	The structure of the schools remains the same, even considering the damages more or less important. We cannot reduce the time for this estimation.
4	0		200	The budget estimation is a fixed procedure, we need time and to have a time to proceed properly to it.
5	0		500	
6	4		1000	The architectural plans could be produced before according the efficiency on the architect agency. Moreover, a better budget could be allowed to dedicate a whole team on our project.
7	1		300	The call can be reduced according to the number of proposals we receive in a short period of time. If we have a necessary number of proposal in less time then we can stop the call for tenders.
8	1		300	It is possible that among the proposals, one is identified clearly as the best (considering the budget, materials, structure and trust in this company). The choice is evident and reduce the time of the evaluation.
9	0		15	The procedure to select the company (meeting, contract signature, etc.) can be crashed since it is a fixed time needed.
10	1		500	The campaign could more efficient and provides enough donations and volunteers before the finishing date.
11	0,5		500	Evidence of one candidate on all other candidate. Simplification of the hiring process.
12	0		50	Recruiting volunteers cannot crash because it's a process that can continue within the time and required some action that take time (e.g. flight booking, accommodation organization, etc.)
13	1		1000	If the estimation of the damages is less than expected then the cleaning stage is reduced as well. (but could requires more employees)
14	0		9000	Material purchases is an important step and it's not considered as a crashed task.
15	4		600	The licenses getting is depending on the administration. On this period, it is possible to accelerate the process thanks to the administrative fastness. Moreover, we can provide a complete and better dossier from the beginning, which simplifies the treatment from the administration.
16	0		700	
17	2		2000	We can provide more employees during this stage and then the reconstruction will be more efficient.
18	4		3000	We can provide more employees during this stage and then the reconstruction will be more efficient.
19	2		2500	We can provide more employees during this stage and then the reconstruction will be more efficient.
20	0		800	
21	1		700	Providing more people on the purchasing tasks to get the equipment faster. As well, it is possible that we need less equipment to purchase because we receive some donations or suppliers are efficient.
22	0,5		500	Probably less equipment to install in the schools.
23	0		3000	Controlling facilities is a fixed-term procedure that we cannot reduced in term of time.
24	0		1000	Inauguration is a fixed-term procedure that we cannot reduced in term of time.

According to our CPM Model, we need 68 weeks to complete the project. However, we would reduce this time by 20%. Then, in this new plan, we have to dedicate 54,4 weeks to complete it.

Activity	Description	Predecessor	Time	EST	EFT	LST	LFT	Slack
1	Kick off the project		0	0	0	13	13	13
2	Evaluating the damages		2	0	2	0	2	0
3	Analyzing the location	2	2	2	4	2	4	0
4	Budget and time estimation	2	2	2	4	2	4	0
5	Contracting an architect agency	3,4	1	4	5	4	5	0
6	Establishing architectural plans	5	12	5	17	5	17	0
7	Call for companies' proposals	5,11	4	6	10	13	17	7
8	Evaluating proposals	6,7	2	17	19	17	19	0
9	Selecting the main company	8	1	19	20	19	20	0
10	Campaigning for donations and volunteers	6	4	17	21	22	26	5
11	Recruiting managerial employees	4	2	4	6	11	13	7
12	Recruiting volunteers	9,10	2	21	23	26	28	5
13	Clean the area	12,15	2	28	30	28	30	0
14	Purchasing the reconstruction materials	15	1	28	29	29	30	1
15	Getting the licenses and permits	9	8	20	28	20	28	0
16	Implementing the security on the worksite	15	1	28	29	29	30	1
17	Building the foundations	13,14,16	8	30	38	30	38	0
18	Building the main structure	17	16	38	54	38	54	0
19	Finishing the structure	18	8	54	62	54	62	0
20	Cleaning the worksite	19	2	62	64	62	64	0
21	Purchasing equipment and materials	16	2	29	31	62	64	33
22	Installing facilities	20,21	2	64	66	64	66	0
23	Controlling facilities and securities	22	1	66	67	66	67	0
24	Inaugurating the schools	23	1	67	68	67	68	0

### Project summary

	Activity	Normal		Crash		Max	Crash Cost
		Time	Cost	Time	Cost	Crashing	Per Day
Kick off the project	1	0,14	\$ 200,00	0,1	\$ 220,00	0,1	\$ 222,22
Evaluating the damages	2	2	\$ 3.000,00	1	\$ 3.100,00	0,5	\$ 200,00
Analyzing the location	3	2	\$ 1.000,00	1	\$ 1.500,00	0,5	\$ 1.000,00
Budget and time estimation	4	2	\$ 2.000,00	1	\$ 2.200,00	0,5	\$ 400,00
Contracting an architect agency	5	1	\$ 5.000,00	0,5	\$ 5.500,00	0,2	\$ 2.500,00
Establishing architectural plans	6	12	\$ 3.000,00	5	\$ 3.300,00	1,5	\$ 200,00
Call for companies' proposals	7	4	\$ 800,00	2	\$ 830,00	0,5	\$ 60,00
Evaluating proposals	8	2	\$ 500,00	1	\$ 550,00	0,5	\$ 100,00
Selecting the main company	9	1	\$ 200,00	0,5	\$ 215,00	0,1	\$ 150,00
Campaigning for donations and volunteers	10	4	\$ 3.000,00	2	\$ 3.100,00	0,5	\$ 200,00
Recruiting managerial employees	11	2	\$ 2.000,00	1	\$ 2.800,00	0,5	\$ 1.600,00
Recruiting volunteers	12	2	\$ 700,00	1	\$ 750,00	0,2	\$ 250,00
Clean the area	13	2	\$ 7.000,00	1	\$ 7.600,00	0,9	\$ 666,67
Purchasing the reconstruction materials	14	1	\$ 20.000,00	0,5	\$ 29.000,00	0,2	\$ 45.000,00
Getting the licenses and permits	15	8	\$ 5.000,00	6	\$ 6.000,00	1,5	\$ 666,67
Implementing the security on the worksite	16	1	\$ 8.000,00	0,5	\$ 8.700,00	0,1	\$ 7.000,00
Building the foundations	17	8	\$ 15.000,00	7	\$ 17.000,00	1,0	\$ 2.000,00
Building the main structure	18	16	\$ 25.000,00	4	\$ 30.000,00	1,5	\$ 3.333,33
Finishing the structure	19	8	\$ 10.000,00	6	\$ 19.000,00	1,0	\$ 9.000,00
Cleaning the worksite	20	2	\$ 5.000,00	0,5	\$ 5.800,00	0,2	\$ 4.000,00
Purchasing equipment and materials	21	2	\$ 10.000,00	1	\$ 13.000,00	0,8	\$ 3.750,00
Installing facilities	22	2	\$ 8.000,00	1	\$ 10.000,00	0,5	\$ 4.000,00
Controlling facilities and securities	23	1	\$ 5.000,00	0,5	\$ 8.000,00	0,2	\$ 20.000,00
Inaugurating the schools	24	1	\$ 3.000,00	0,5	\$ 4.000,00	0,2	\$ 5.000,00

This table is based on the data available before, provided with explanations.

LP Model For Project Crashing

Nodes		Start	Amount			Arcs				Allowable Crash Days
Activity	Normal Time	Start Time	Crashed	From	To	Time to start successive task	time to finish predecessor task			
1	0	0	0	\$0	1	2	0	≥	0	0
2	2	0	0,5	\$500	2	3	1,5	≥	1,5	0,5
3	2	1,5	0	\$0	3	5	3,5	≥	3,5	0
4	2	1,5	0	\$0	4	5	3,5	≥	3,5	0
5	1	3,5	0	\$0	5	6	4,5	≥	4,5	0
6	12	4,5	4	\$1 000	6	10	12,5	≥	12,5	4
7	4	5	0	\$300	7	8	12,5	≥	9	1
8	2	12,5	1	\$300	8	9	13,5	≥	13,5	1
9	1	13,5	0	\$0	9	12	15,5	≥	14,5	0
10	4	12,5	1	\$500	10	12	15,5	≥	15,5	1
11	2	3,5	0,5	\$500	11	7	5	≥	5	0,5
12	2	15,5	0	\$0	12	13	18,5	≥	17,5	0
13	2	18,5	1	\$1 000	13	17	19,5	≥	19,5	1
14	1	18,5	0	\$0	14	17	19,5	≥	19,5	0
15	8	14,5	4	\$600	15	13	18,5	≥	18,5	4
16	1	18,5	0	\$0	16	17	19,5	≥	19,5	0
17	8	19,5	2	\$2 000	17	18	25,5	≥	25,5	2
18	16	25,5	0	\$3 000	18	19	41,5	≥	41,5	4
19	8	41,5	1	\$2 500	19	20	48,5	≥	48,5	2
20	2	48,5	0	\$0	20	22	50,5	≥	50,5	0
21	2	19,5	0	\$700	21	22	50,5	≥	21,5	1
22	2	50,5	0,1	\$500	22	23	52,4	≥	52,4	0,5
23	1	52,4	0	\$0	23	24	53,4	≥	53,4	0
24	1	53,4	0	\$0	24	24	53,4	≥	54,4	0

Finish Time

54,4

Desired Final time

54,4

C

Total Crash Cost

\$15 250

Here, the solutions to reduce the time by 20%, where the cost is minimized. In adding the maximum crash days to reduce the project at 54,4 weeks, then the total crash cost will be \$15,250. In the excel file, it could be found an extension of the CPM adapted to this time reduction.

## ASSIGNMENT 4

Risks considered in our project

### Technical/Project Risks

**Impact \* probability**

1. **Shortage of construction materials or machinery:** supplier do not arrive on time for construction or specific machinery is required to work in certain fields. **2\*2=4**
2. **Low efficiency of the architect agency:** The plan proposed by the agency are not suitable or it exists an error with the reconstruction site. **2\*3=6**
3. **Lack of capable employees (managers):** Managers are not efficient enough. The project does not run according to the plan. **3\*2=6**
4. **Lack of donations/withdrawal of donators:** Campaign was not captivating enough to encourage donators. **3\*4=12**
5. **Theft of materials:** a potential lack of security or malicious employees could lead to some theft. We need to spend time again to purchase them and the cost is not included in the budget. **2\*1=2**
6. **Accident in the work field:** employees could be victim of an accident during the work because of potential collapse in the structure. they could be hurt and then slowing the reconstruction phase. **3\*2=8**
7. **Cost overrun by construction company:** Hired construction company spends more time and money than expected on the worksite. **2\*4=8**

### Industry/Competitive Project

8. **Construction company backs down after better proposal:** The company decides to let down the worksite and the contract to propose its services to another reconstruction that offer better benefits. Thus, we have to find another company offering the same quality of services. Then, the time is delayed for an unknown period. **4\*2=8**
9. **Construction company enters in bankruptcy:** because of industry state and high competition, the construction company could be financially weak and then the hiring period be obliged to go bankrupt. **4\*2=8**
10. **Reputational risks:** the reconstruction could be bad managed and then the quality of the new building quite low. Us, as an organization, could have reputational damages and don't be trust anymore in the reconstruction. **1\*2=2**

### Country/Fiscal

11. **Missing documents, or deadline to apply for licenses:** We need more time to understand and provide documents and declarations to the administration in order to get a specific license. Here, the risk is the misunderstanding, lack of knowledge of the administrative process in Jamaica. **1\*5=5**
12. **Public objection:** movements against construction on certain areas. **4\*1=4**
13. **Pressure from authorities to bring forward the deadline:** The government would prefer having the reconstruction done at the sooner. They would put pressure in order to succeed that. The risk here to considerably overrun the budget to allow more resources. **3\*3=9**
14. **Lawsuits after accident in the work field:** linked to potential accidents, lawsuits could be effective against our organization for wrk bad conditions. It could slow the project and cost a lot to compensate the victims. **4\*2=8**

15. **New regulations and policies in Jamaica:** some new plans, policies could be implemented in the country during the project running. She should have to take them into consideration in more. according to what is it about, it could represent a (high) cost and increase of time. **3\*4=12**
16. **Governmental objection:** The government against the reconstruction provided by an external organization (doing by itself). They would delay all the documents, licenses getting and others in order to delay the project. **3\*1=3**

#### Market Risks

17. **Inflation leading to increase of prices,** therefore need for expand the budget. **2\*3=3**
18. **Currency change:** between the different currencies implied. It could increase the price of materials, equipment's, etc. and will overrun the budget. **2\*3=6**

#### Natural Risks

19. **Bad weather conditions:** hurricane happens during the reconstruction phase, that means the work is stopping for a moment or worse completely stopped because the works already done, have been destroyed. **5\*3=15**
20. **Outbreak of a COVID variant:** Another variant can be spread again all over the world, and entire with new period of quarantines. **2\*2=4**

### Quantitative assessment

Probability Consequence	Frequent	Probable	Improbable	Impossible
Catastrophic 1.0	1 HIGH	0.7	0.45	0.0
Critical 0.9 – 0.6	0.8	0.5 MEDIUM	0.4	0.0
Marginal 0.5 – 0.3	0.6	0.4	0.2 LOW	0.0
Negligeable 0.3 – 0.0	0.3	0.2	0.1	0.0

**Risk = probability \* Consequence**

### Risk Sector Plot

Attribute: Probability		
Level	Value	Criteria
5	Near certainty	Everything points to this becoming a problem, always has.
4	Very likely	High chance of this becoming a problem
3	Likely	There is an even chance this may turn into a problem
2	Unlikely	Risk like this may turn into a problem once in awhile
1	Improbable	Not much chance this will become problem



Attribute: Impact				
Level	Value	Technical Criteria	Cost Criteria\$	Schedule Criteria
5	Catastrophic	Impossible to continue with the construction	> 5M	Absolute stop of the project.
4	Critical	Adjustment in the construction planning. Back in schedule asap.	2M<X<5M	Almost doubling the time expected.
3	Moderate	Extra cost/time but adjusted to the budget.	750K<X<2M	Big delay on schedule: from couple to several months.
2	Marginal	Proper conclusion of the project despite little delay or extra cost.	5K<X<750K	Loss of one or couple of weeks on schedule.
1	Negligible	No impact	< 5K	Minimum to no impact

## Risk Matrix

Probability	5	11				
	4		7	15 4		
	3		17 2 18	13		19

	2	10	20 1	3 6	9 14 8	
	1		5	16	12	
		1	2	3	4	5
	Impact					

### Importance of risk

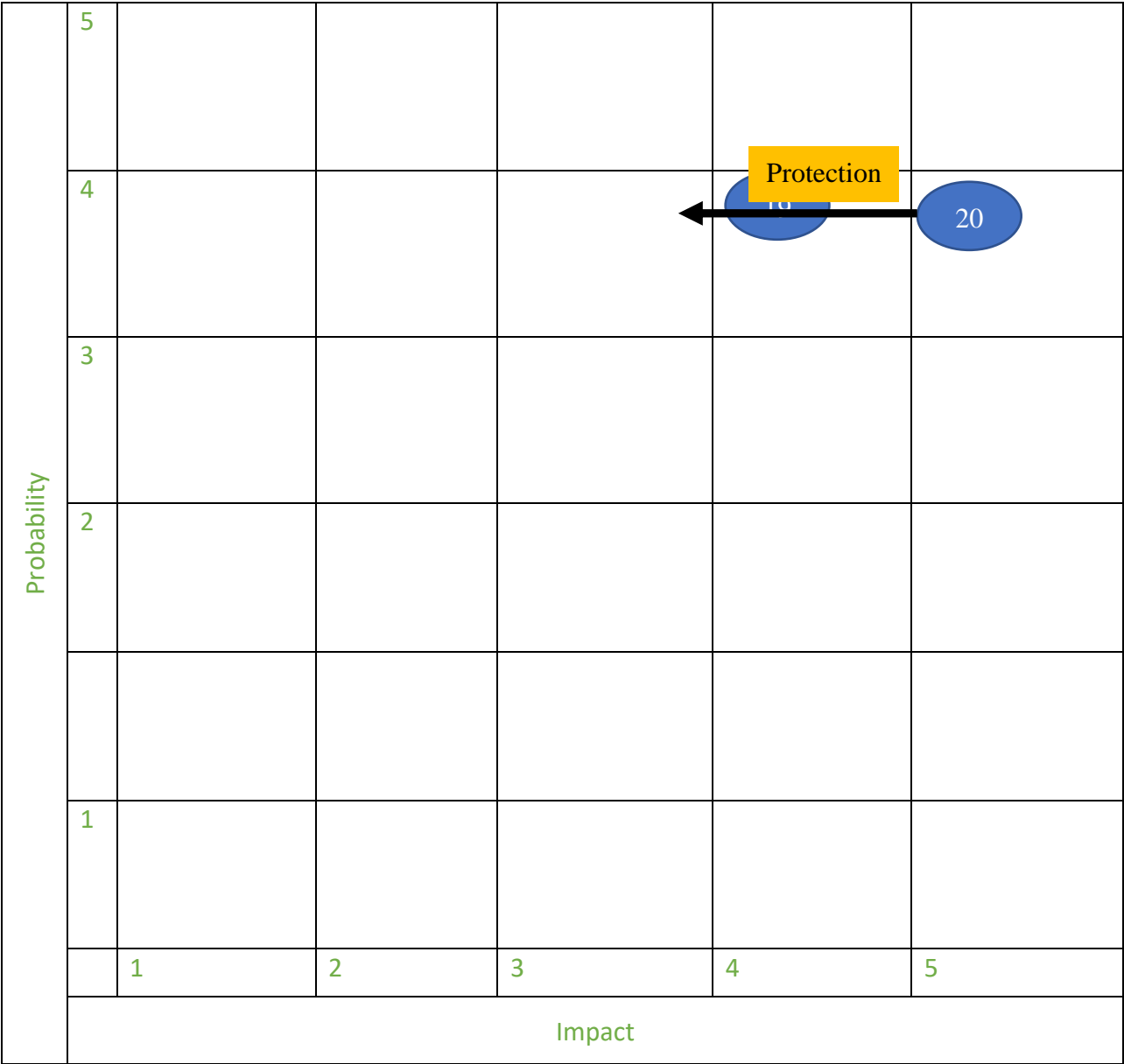
ID	Risk Description	Risk Score
19	Bad weather conditions	15
4	Lack of donations	12
15	New regulations and policies in Jamaica	12
13	Pressure from authorities to bring forward the deadline	9
6	Accident in the work field	8
7	Cost overrun by construction company	8
8	Construction company backs down after better proposal	8
9	Construction company enters in bankruptcy	8
14	Lawsuits after accident in the work field	8
2	Low efficiency of the architect agency	6
3	Lack of capable employees	6
18	Currency change	6
11	Missing documents, or deadline to apply for licenses	5
1	Shortage of construction materials or machinery	4
12	Public objection	4
20	Outbreak of a COVID variant	4
16	Governmental objection	3
17	Inflation leading to increase of prices	3
5	Theft of materials	2
10	Reputational risks	2

### Risk Mitigation Plan

ID	Risk	Risk Score	Mitigation
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<b>19</b>	<b>Bad weather conditions</b>	<b>15</b>	Local support/expand number of volunteers.
<b>4</b>	<b>Lack of donations</b>	<b>12</b>	Look for sponsors
<b>15</b>	<b>New regulations and policies in Jamaica</b>	<b>12</b>	Readjustment of plans (importance to follow local restrictions).
<b>13</b>	<b>Pressure from authorities to bring forward the deadline</b>	<b>9</b>	Meeting with authorities. Bring facts and figures that justify the time required
<b>6</b>	<b>Accident in the work field</b>	<b>8</b>	Accident protocol activation. Contact health insurance
<b>7</b>	<b>Cost overrun by construction company</b>	<b>8</b>	Fixed cost/readjustment of actives
<b>8</b>	<b>Construction company backs down after better proposal</b>	<b>8</b>	Re-contact potential contractors
<b>9</b>	<b>Construction company enters in bankruptcy</b>	<b>8</b>	Public tender
<b>14</b>	<b>Lawsuits after accident in the work field</b>	<b>8</b>	Organization attorney
<b>2</b>	<b>Low efficiency of the architect agency</b>	<b>6</b>	Architectural consultancy to review or redesign the plans
<b>3</b>	<b>Lack of capable employees</b>	<b>6</b>	Recruitment campaign/assignation of internal members to lead the project
<b>18</b>	<b>Currency change</b>	<b>6</b>	Currency fluctuation forecast
<b>11</b>	<b>Missing documents, or deadline to apply for licenses</b>	<b>5</b>	Contract local lawyer
<b>1</b>	<b>Shortage of construction materials or machinery</b>	<b>4</b>	Urgent research for new suppliers
<b>12</b>	<b>Public objection</b>	<b>4</b>	Awareness raising campaign/testimonies
<b>20</b>	<b>Outbreak of a COVID variant</b>	<b>4</b>	Quarantine and isolation protocol
<b>16</b>	<b>Governmental objection</b>	<b>3</b>	Awareness raising campaign/testimonies
<b>17</b>	<b>Inflation leading to increase of prices</b>	<b>3</b>	Sponsors/public tenders
<b>5</b>	<b>Theft of materials</b>	<b>2</b>	inventory tracking, security system improvement
<b>10</b>	<b>Reputational risks</b>	<b>2</b>	Marketing campaign/testimonials

Capture Effect of Mitigation Policies



Assignment

	<b>Activity</b>	<b>Time</b>	<b>Cost</b>
Kick off the project	1	0	\$ 200,00
Evaluating the damages	2	2	\$ 3 000,00
Analyzing the location	3	2	\$ 1 000,00
Budget and time estimation	4	2	\$ 2 000,00
Contracting an architect agency	5	1	\$ 5 000,00
Establishing architectural plans	6	12	\$ 3 000,00
Call for companies' proposals	7	4	\$ 800,00
Evaluating proposals	8	2	\$ 500,00
Selecting the main company	9	1	\$ 200,00
Campaigning for donations and volunteers	10	4	\$ 3 000,00
Recruiting managerial employees	11	2	\$ 2 000,00
Recruiting volunteers	12	2	\$ 700,00
Clean the area	13	2	\$ 7 000,00
Purchasing the reconstruction materials	14	1	\$ 20 000,00
Getting the licenses and permits	15	8	\$ 5 000,00
Implementing the security on the worksite	16	1	\$ 8 000,00
Building the foundations	17	8	\$ 15 000,00
Building the main structure	18	16	\$ 25 000,00
Finishing the structure	19	8	\$ 10 000,00
Cleaning the worksite	20	2	\$ 5 000,00
Purchasing equipment and materials	21	2	\$ 10 000,00
Installing facilities	22	2	\$ 8 000,00
Controlling facilities and securities	23	1	\$ 5 000,00
Inaugurating the schools	24	1	\$ 3 000,00

## Assignemnt 5

Once computed the BCWS, BCWP, ACWP, BAC and the EAC, we could identify the variances and indexes. We know that our project counts in general, with an overrun of costs, the actual cost of the projects has exceeded the budgeted one –we decided to set the numbers like this, just to create a hypothetical negative scenario. Also, in most of the cases, the index is lower than 1.

On the other side, regarding the schedule variance, we noticed that in general the projects go ahead schedule. Column 3 shows how most of the tasks count with a positive figure and the index is greater than 1. Therefore, we can assume that the extra cost is due to the speed.

Cost Variance	Cost Index	Schedule Variance	Schedule Index
0	1,00	0	1
-1500	0,73	1000	1,33
300	1,43	0	1
500	1,20	1000	1,5
-500	0,93	1500	1,3
-800	0,79	0	1
-50	0,94	50	1,06
-120	0,68	-250	0,5
50	1,33	0	1
-1000	0,82	1500	1,5
-1500	0,63	500	1,25
-100	0,88	0	1
-250	0,97	250	1,03571429
-3000	0,88	2000	1,1
500	1,10	500	1,1
1500	1,21	500	1,0625
-1000	0,94	1000	1,06666667
-2500	0,91	-1000	0,96
-2000	0,83	0	1
-500	0,92	500	1,1
-500	0,95	500	1,05
-1500	0,82	-1000	0,875
0	1,00	0	1
200	1,08	-300	0,9

## Appendix - Maximum time crashing



LP Model For Project Crashing					Arcs					Allowable Crash Days
Nodes		Start	Amount	Time to start		time to finish				
Activity	Normal Time	Time (ti)	Crashed (Ci)	From	To	successive task	predecessor task			
1	0	0	0	1	2	0	≥ 0	0		
2	2	0	0,5	2	3	1,5	≥ 1,5	0,5		
3	2	1,5	0	3	5	3,5	≥ 3,5	0		
4	2	1,5	0	4	5	3,5	≥ 3,5	0		
5	1	3,5	0	5	6	4,5	≥ 4,5	0		
6	12	4,5	4	6	10	12,5	≥ 12,5	4		
7	4	5	1	7	8	12,5	≥ 8	1		
8	2	12,5	1	8	9	13,5	≥ 13,5	1		
9	1	13,5	0	9	12	15,5	≥ 14,5	0		
10	4	12,5	1	10	12	15,5	≥ 15,5	1		
11	2	3,5	0,5	11	7	5	≥ 5	0,5		
12	2	15,5	0	12	13	18,5	≥ 17,5	0		
13	2	18,5	1	13	17	19,5	≥ 19,5	1		
14	1	18,5	0	14	17	19,5	≥ 19,5	0		
15	8	15,5	4	15	13	18,5	≥ 19,5	4		
16	1	18,5	0	16	17	19,5	≥ 19,5	0		
17	8	19,5	2	17	18	25,5	≥ 25,5	2		
18	16	25,5	4	18	19	37,5	≥ 37,5	4		
19	8	37,5	2	19	20	43,5	≥ 43,5	2		
20	2	43,5	0	20	22	45,5	≥ 45,5	0		
21	2	19,5	1	21	22	45,5	≥ 20,5	1		
22	2	45,5	0,5	22	23	47	≥ 47	0,5		
23	1	47	0	23	24	48	≥ 48	0		
24	1	48	0	24	24	48	≥ 49	0		

Finish Time

49

This table represents the minimization of time possible used to complete the project as soon as possible, regardless the cost constraint. The project could be completed 49 weeks, then 19 weeks before.