KATHMANDU UNIVERSITY
SCHOOL OF ENGINEERING
DEPARTMENT OF GEOMATICS ENGINEERING

FINAL REPORT ON

PREPARATION OF 3D MODEL OF WILDLIFE CROSSING BRIDGE

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Table of contents

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

3D	Three dimension
R.F.	Representative factor

1. INTRODUCTION

1.1 Background

The project entitled as “Preparation of 3D Model of Wildlife Crossing Bridge” is an engineering project of students of Geomatics Engineering, Kathmandu University, which is the part of the course ENGG 102 of I Year/II Semester.

3D Modelling is simply the creation of virtual three dimensional of some physical objects based on mathematical representations and suitable scaling(Vázquez-Méndez, Casal, Santamarina, & Castro, 2018). The concepts of volume and of the third dimension are not recent discoveries. Further, the idea of 3D Modelling constitutes an archaeological component which has been serving from the beginning as a tool for representing accurate photorealism (Camp, 2014). The advantages of 3D Modelling over 2D Modelling are:

- Realistic, easy and quick to understand about prospective like angle and elevation.
- Offers the clear measurements and physical dimensions.
- Provides better visual appearance than 2D.

Wildlife crossing bridge is a structure made for wild animals to cross the highways(Smith, Van Der Ree, & Rosell, 2015). These structures are made in busy roads constructed in the middle of the forests. Wildlife crossing bridges like these will help safe migration of animals from one place to another as well as it prevents the possible accidents which may cause the loss of life of both humans and animals. Wildlife crossings are a practice in habitat conservation, allowing connections or reconnections between habitats, combating habitat fragmentation. They also assist in avoiding collisions between vehicles and animals, which in addition to killing or injuring wildlife may cause injury to humans and property damage.

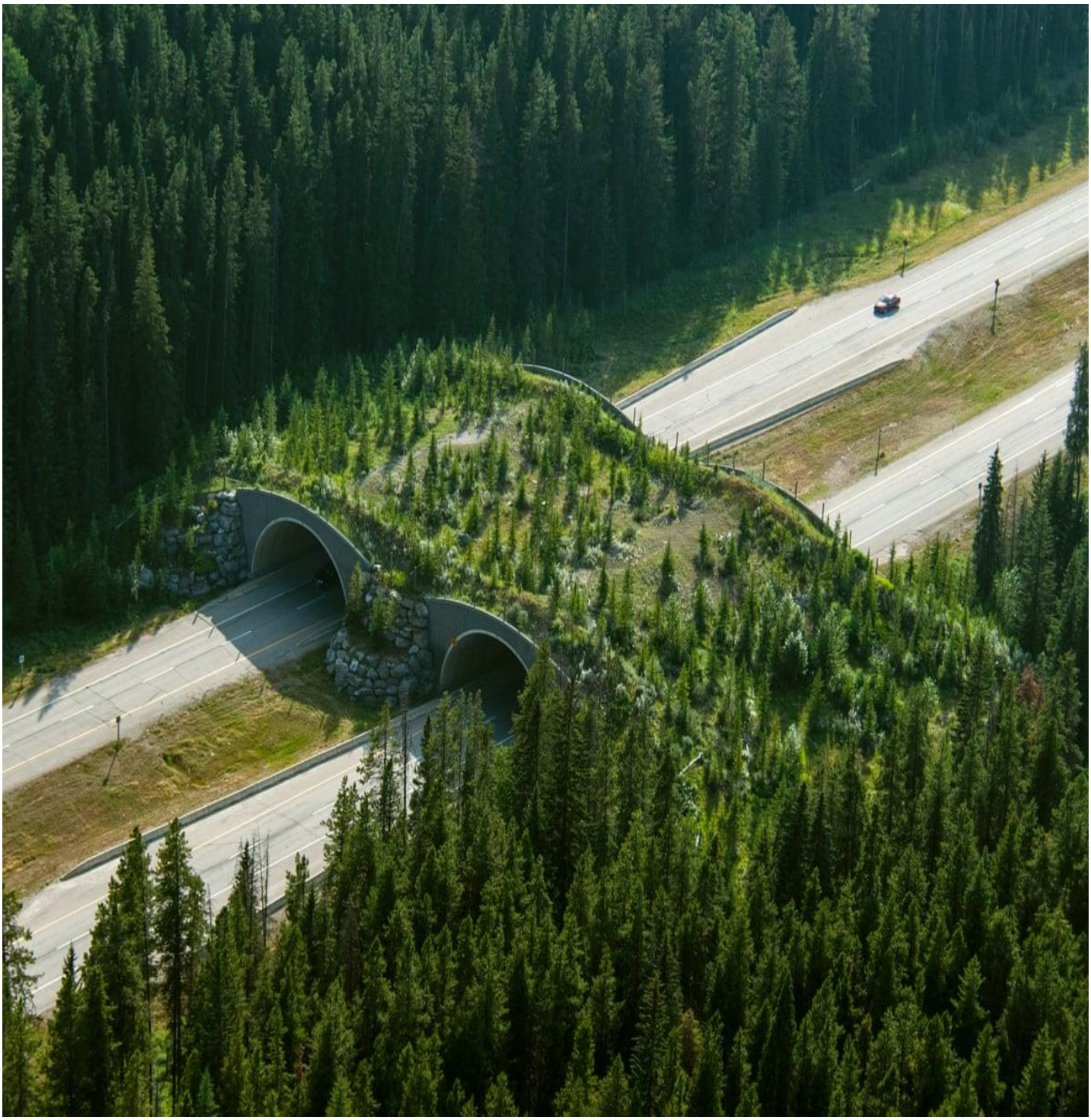

Figure 1:A wildlife overpass in Banff national park, in the Canadian Rockies.

1.2 Problem Statements

We have prepared 3D Model of Wildlife Crossing which has not been carried out yet by the seniors too. So this is the project that represents the 3D model of Wildlife Crossing. This project helps for the effective migration of animals and helps in wildlife conservation.

1.3 Objectives

The key objective of this project is:

- To prepare 3D Model Wildlife Crossing Bridge.

The secondary objectives that will be incorporated during the accomplishment of primary objective are highlighted below:

- To learn about methods involving in preparation of 3D model
- To gain the experience of teamwork in working environment
- To achieve knowledge and experience on developing a solid structure from raw materials like cardboard, chart paper, thermocol, etc
- To acquire the idea about design estimation and financial estimation.

1.4 Scope

The project dealt with the study and preparation of 3D Model of a Wildlife Bridge. We prepared a 3D Model of the Wildlife Crossing Bridge. This model incorporated the features of the site such as bridge, forests and road.

However, this project is not the exact copy of existing structure. It is a concept that can be used in future. The dimensions of bridge and roads are taken as standard dimensions from internet sources.

2. METHODOLOGY

2.1 Theoretical Framework

Our project is based on analyzing suitable data of the bridge and representing the structure in a 3D Model. The process of creating a mathematical representation of a three dimensional object or shape is called 3D modeling. Architecture, construction, product development, industries are widely using 3D models for visualization. 3D modeling in construction is widely gaining popularity due to the advantages it offers. There is no doubt that use of 3D modeling in construction results in better designing and material utilization. 3D models can be rotated for different perspectives and gather additional views. (LIU Chuan, 2007)

Basic theoretical principle of 3d modeling is:

- Use and represent every piece of information.
- Choose the modeling method according to the current knowledge on the problem.
- Choose the appropriate techniques.

According to the literature from the 3d model we can determine the aspects to picturize and improve the design of the structure. We can improve interface to study complex/congested reinforcement details, ability to analyze individual structure components, easier to generate and update 2D drawings of specific components. Improve observation of the interactions between structure and other disciplines by providing a common platform for the integration of design content. Provide the ability to perform construction analysis including site preparation and scheduling.

2.2 Study Area

The model wildlife bridge, we are making is imaginary, so it can be made in future in real life.In Nepal, about 400 km of the East-West highway slice through national parks in Parsa,Chitwan, Bardia, Banke, So this bridge can be made in the East-West highway in any of the busy roads in these national parks.

2.3 Study Method/Design

The methodology used in our project is represented in the methodological flow diagram as follows:

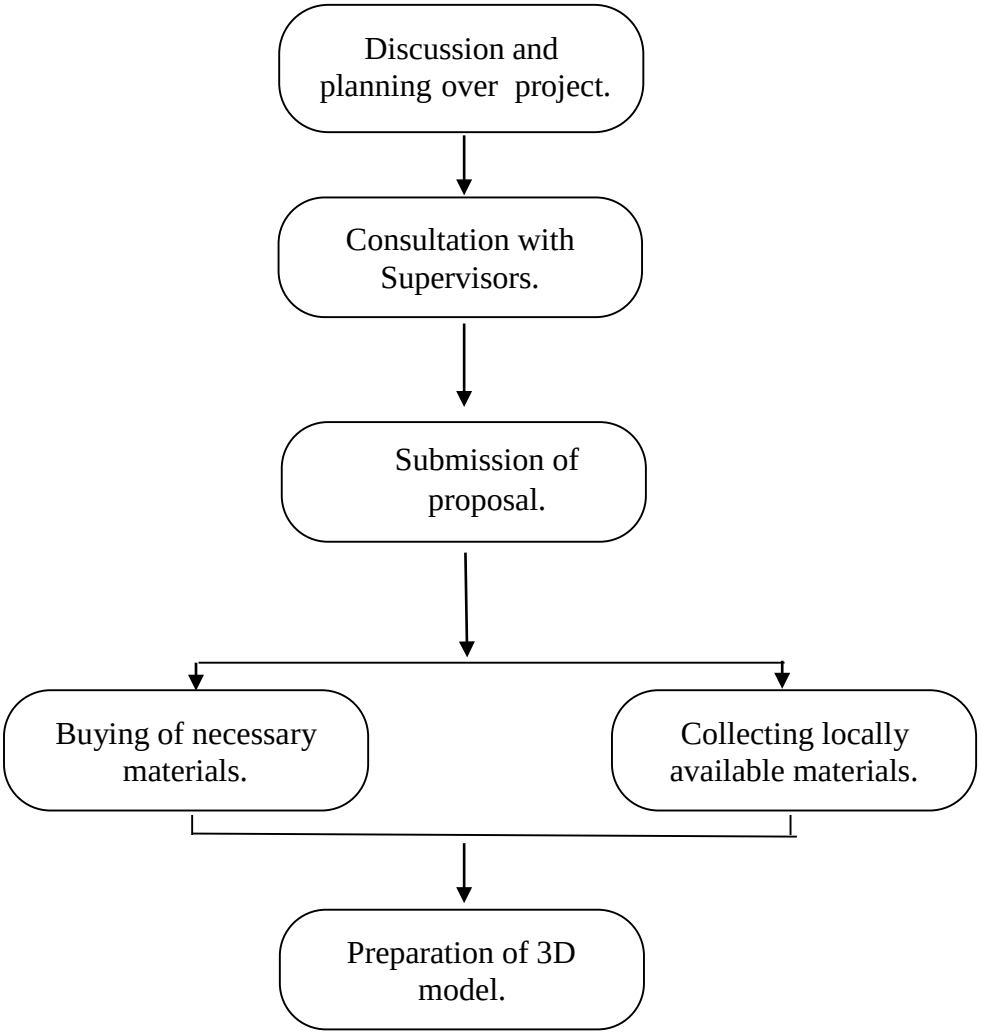

Figure 2: Methodological Flow Diagram

1. Preliminary Research

We did the preliminary research for the references from different YouTube videos, articles and internet surfing. The research was done to get the intense idea on 3D Modelling, to identify the problems that would be appearing during the problem and the ways to handle the problems.

2. Consultation

We consulted with faculties of our department regarding various things about our project. Our supervisors helped us on various things regarding our model. Seniors also guided us in our project.

3. Data Collection

We took data for our project from various secondary sources. The lane of roads were taken standard provided by Nepal Road Standard. The dimensions of the bridge were taken from a Youtube video of following link:

https://www.youtube.com/watch?v=JtVHemukKgk&ab_channel=WPI

We reduced the scale as:

Horizontal: 1:70

Vertical: 1:80

4. Material Collection

Plywood, thermocol, scissors, hot glue gun, painting colors, chart paper, etc were basic materials for our 3D model. We bought these materials.

5. Preparation of Model

After the collection of data and required materials, we started scaling and estimating the shape and size of the model. The model has plywood as its base and over the plywood, thermocol and other materials representing the topography.

We planned our model in following way:

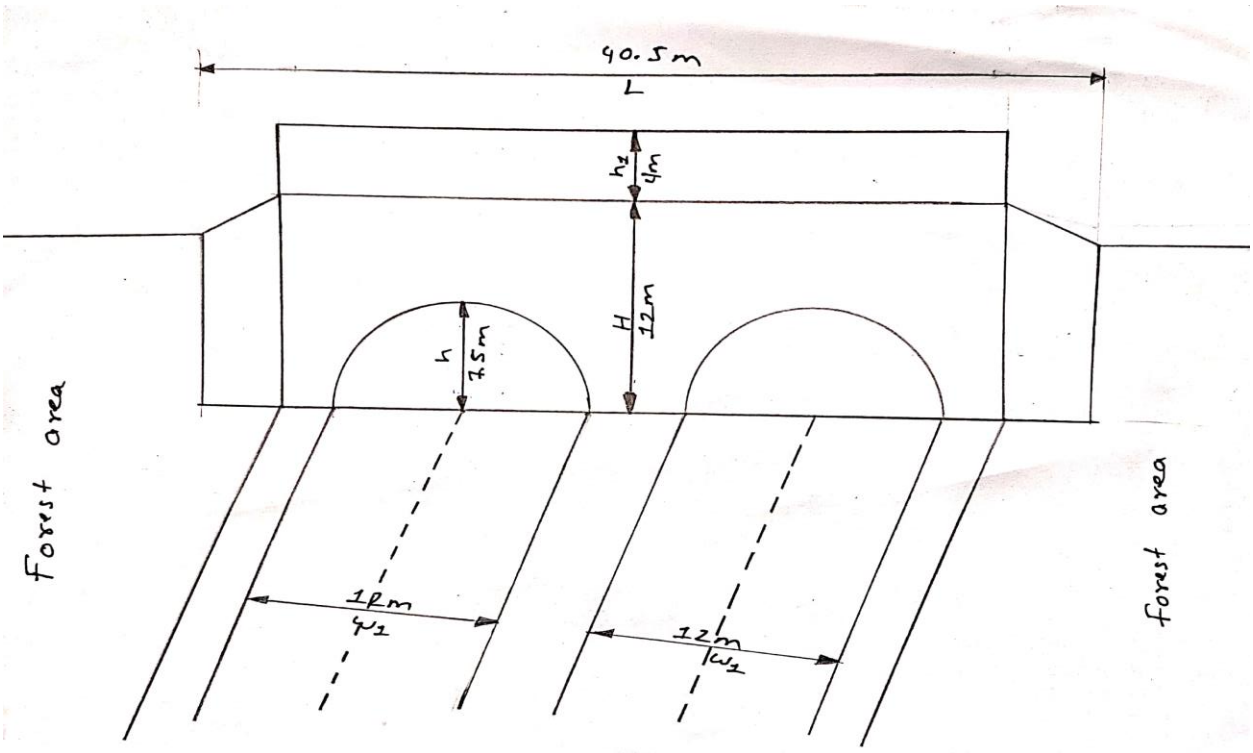

Figure 3: A Front view of our model

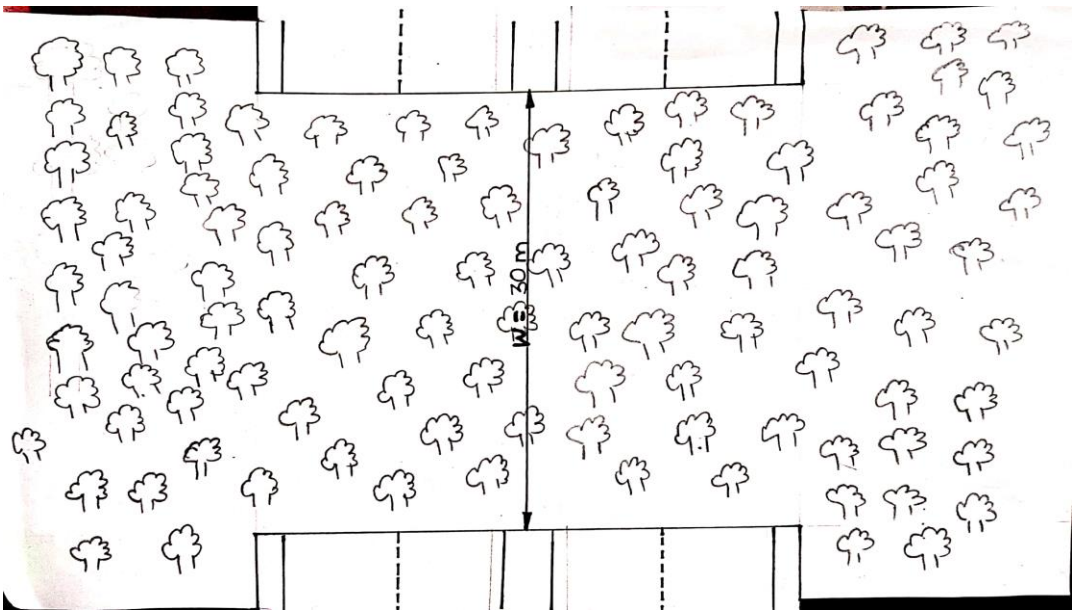

Figure 4: A Top view of our model

2.3.1 Data Analysis

The dimensions were reduced as:

Table 1: Scaling

S.N.	Components	Dimension in actual structure(Smith et al.)	Dimension in our model(cm)	R.F.
1	Height of bridge(Smith et al.)	12	61	1:80
2	Width of bridge(W)	30	42.8	1:70
3	Length of Bridge(Smith et al.)	40.5	57.8	1:70
4	Height of the arc(Smith et al.)	7.5	9.37	1:80
5	Height of the bar(h1)	4	5	1:80
6	Width of road(w1)	12	17.14	1:70

2.3.2 Instruments to be used

For the preparation of 3D model we used following instruments:

- Plywood
- Thermocole
- Hot Glue Gun
- Cardboard
- Scissors
- Grass Papers
- Poster color

3. PROJECT MANAGEMENT

3.1 Logical Framework Analysis

Table 2: Logical Framework Analysis

Sub-Objective / **Analysis**	To learn the concept of scale reduction.	To work as a team.	To prepare 3D Model of Wildlife Crossing Bridge.
Method	Calculation	Coordination	Choice of suitable Scale Group work for manual model preparation (Cutting, Fixing, Painting)
Activities	Collection of data and manual mathematical calculation	Data collection, proposal writing, 3D modelling	Choice of suitable Scale Group work for manual model preparation (Cutting, Fixing, Painting)
When	During doing project	From beginning to the end	During completing project
Who	Sonik, Rajan, Pratistha, Swornim, Susham	Susham, Swornim, Pratistha, Rajan, Sonik	Sonik, Rajan, Pratistha, Swornim, Susham
Risk	Inaccuracy in scale reduction	Disagreements	Difficulty in modeling each and every small detail
Solutions	Use of precise measurements and help from seniors	Finding suitable solution	Generalization

4. BUDGET OUTCOME

The following table shows the total expenditure of our project:

Table 3:Budget Estimation

S.N.	Particulars	**Quantity**	**Rate**	**Total**
i.	Thermocole: Small	5	80	1600
	Big	6	200	
ii.	Fevicol	2	210	420
iii.	Grass paper	3	40	120
iv.	Paper cutter	2	120	240
v.	Brush	4	75	300
vi.	Hot glue stick	21	15	315
vii.	Green Pad	25	15	375
viii.	Chart Paper	3	20	60
ix.	Poster color	6	50	300
			TOTAL	3730

5. OUTCOME

By the end of the project, we designed fully scaled 3-D model of Wildlife Crossing. We learned the methods of scaling and problem tackling. The project also helped us focus on group work and working as a team in the process of meeting these objectives.

6. CONCLUSION

We made a 3D model of wildlife crossing bridge using cardboard and other materials. This model will help to visualize how the real wildlife crossing would look like. We completed it by the methods of cutting, gluing, painting and designing the scaled version of the model.

7. REFERENCES

Smith, D. J., Van Der Ree, R., & Rosell, C. (2015). Wildlife crossing structures: an effective strategy to restore or maintain wildlife connectivity across roads. *Handbook of road ecology*, 172-183.

Vázquez-Méndez, M. E., Casal, G., Santamarina, D., & Castro, A. (2018). A 3D model for optimizing infrastructure costs in road design. *Computer-Aided Civil and Infrastructure Engineering*, *33*(5), 423-439.