

CONTENTS

APPROVAL PAGE	1
SELF DECLARATION AGAINST PLAGIARISM	2
ABSTRACT	3
PREFACE	4
ACKNOWLEDGEMENT	6
CONTENTS.....	8
LIST OF ABBREVIATIONS	11
INTRODUCTION	12
1.1 Background	12
1.2 Problem Identification.....	14
1.3 Objective	16
1.4 Scope of Work.....	16
1.5 Expected Results	16
1.6 Research Methodology.....	17
1.7 Methodology	17
1.7.1 CHAPTER I – INTRODUCTION	17
1.7.2 CHAPTER II – BASIC CONCEPT	17
1.7.3 CHAPTER III – SYSTEM MODEL ANALYSIS	18
1.7.4 CHAPTER IV – RESULT AND DISCUSSION.....	18
1.7.5 CHAPTER V – CONCLUSION, RECOMMENDATION, & FUTURE WORK.....	18
BASIC CONCEPT.....	19
2.1 Land Subsidence	19
2.1.1 Groundwater Withdrawal-Induced Subsidence.....	19
2.1.2 Hydrocarbon Extraction-Induced Subsidence	19
2.1.3 Soil Consolidation.....	20
2.1.4 Tectonic and Geological Subsidence	20
2.2 Rainfall.....	20
2.3 Global Navigation Satellite System (GNSS)	21
2.2.1 Global Positioning System (GPS).....	22
2.2.2 Devices	23
2.4 Data Collecting.....	23

2.5	Temporal Fusion Transformer.....	26
2.6	Regulatory.....	30
2.6.1	Sustainable Development Goals (SDGs)	30
2.6.2	Laws and regulations in Indonesia.....	33
	SYSTEM MODEL AND METHOD	35
3.1	Dataset.....	35
3.2	System Flowchart.....	38
3.3	Technical Analysis	40
3.3.1	Data Handling and Preparation	40
3.3.2	Subsidence Calculation and Feature Engineering.....	41
3.3.3	Timeseries Dataset Preparations	42
3.3.4	Temporal fusion Transformer Model	44
3.3.5	Model Evaluation and Prediction.....	46
3.4	Performance Parameter	47
3.4.1	Mean Absolute Error	48
3.4.2	Root Mean Squared Error (RMSE).....	48
3.4.3	Coefficient of Determinations (R^2)	49
3.5	Regulatory Analysis	49
	RESULT AND DISCUSSION	51
4.1.	Technical Analysis Result	51
4.1.1	Pipeline Efficiency	51
4.1.2	Comparison between Temporal Fusion Transformer and Conventional Transformer.....	52
4.1.3	Model Performance.....	53
4.1.4	Visualization.....	54
4.1.5	Regional Prediction.....	57
4.2.	Regulatory Analysis Result.....	59
	CONCLUSION, RECOMMENDATION, & FUTURE WORK	62
5.1	Conclusion	62
5.1.1	Technical Analysis	62
5.1.2	Regulatory Analysis	62
5.2	Recommendation.....	63
5.3	Future Work.....	64
	REFERENCES.....	66
