Reducing Construction Waste through Prefabrication during Design Stage: A Simulation Approach

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Outline

01 Introduction
02 Model Development
03 Results and Discussions
04 Conclusions

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Introduction

- Background
- Aim

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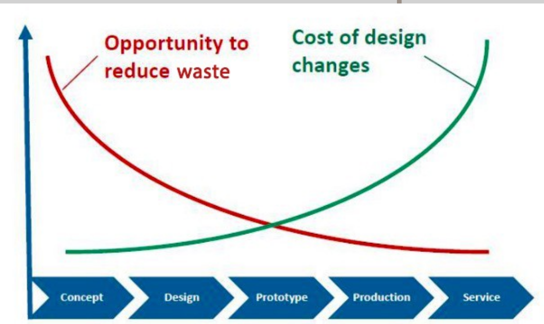
Background

1 Increasing amount of construction waste

2 Socio-economic and environmental benefits of prefabrication methods

3 The design stage can reduce construction waste from the source.

4 Limited previous research



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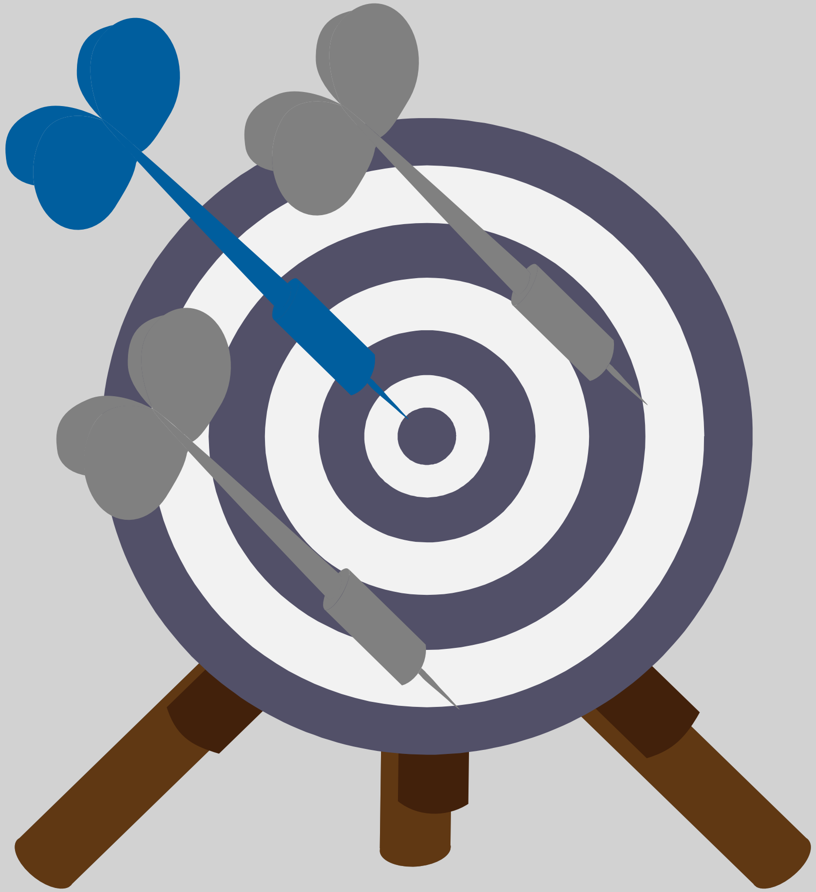
Aim



Aim

Develop a model for assessing the potential of prefabrication on construction waste reduction using a system dynamics approach.

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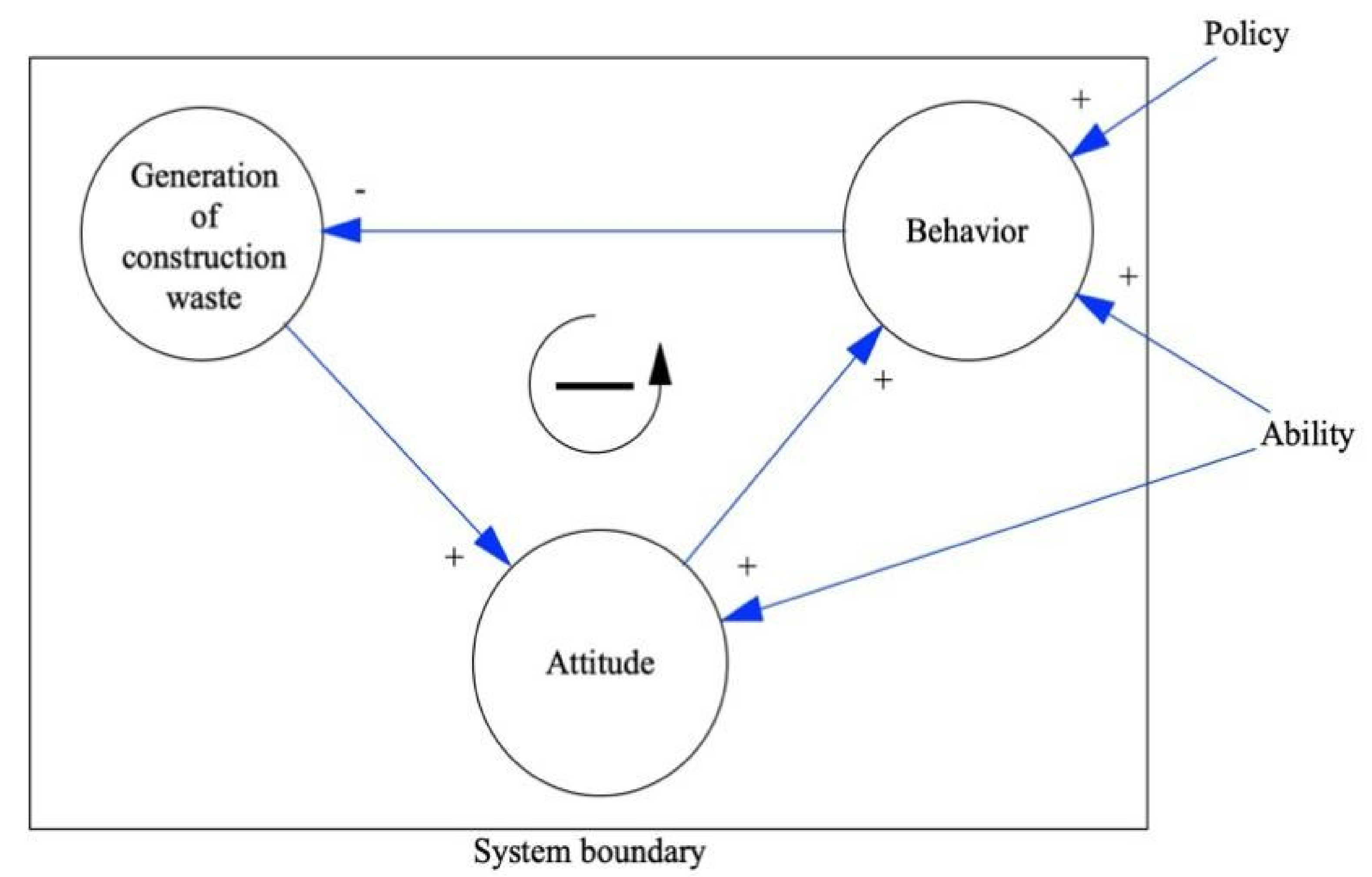
Model Development

- Identify main variables
- Causal-loop Diagram
- Stock-flow Diagram
- Model verification

Identify Main Variables



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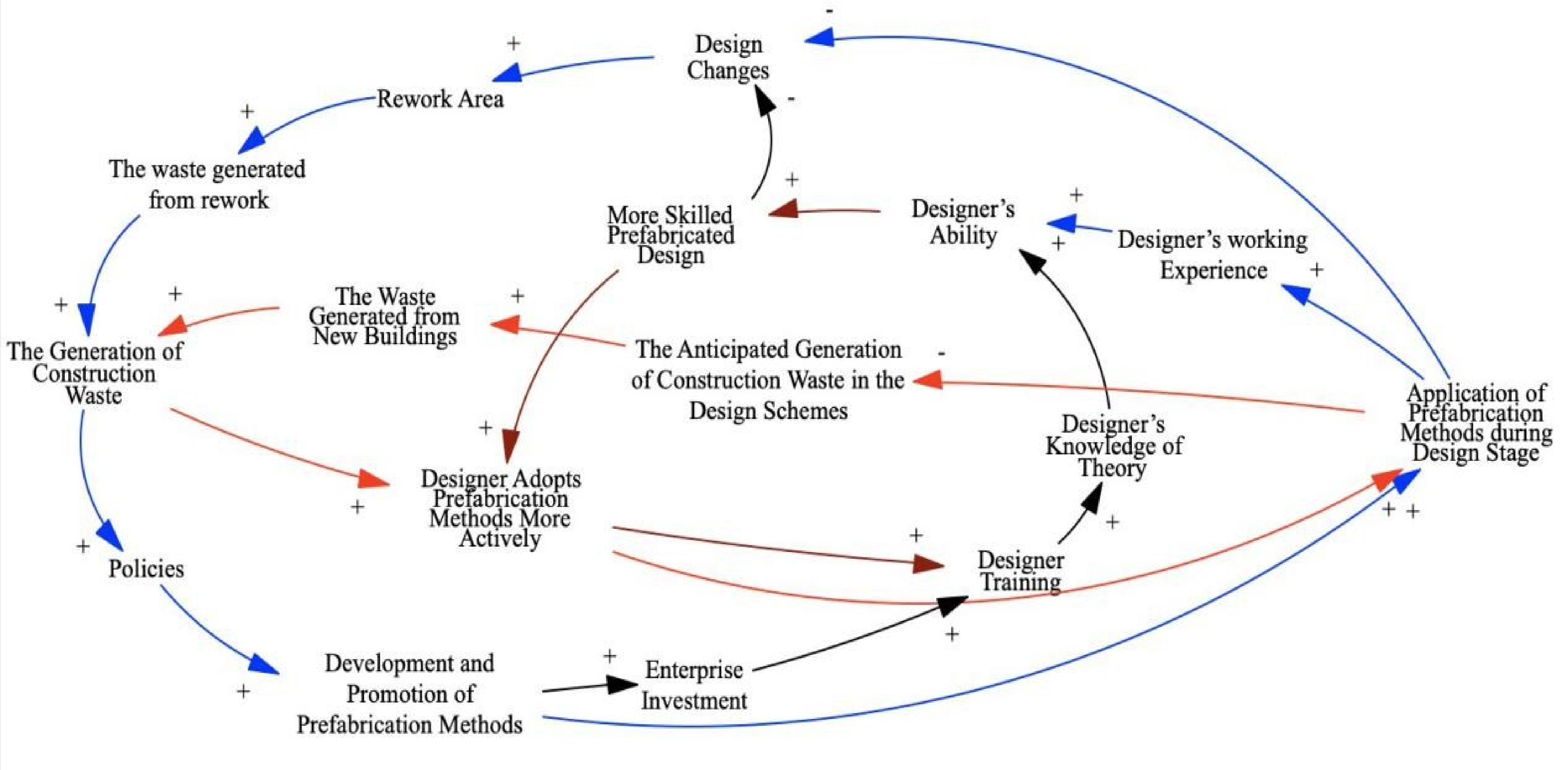
Causal-loop Diagram



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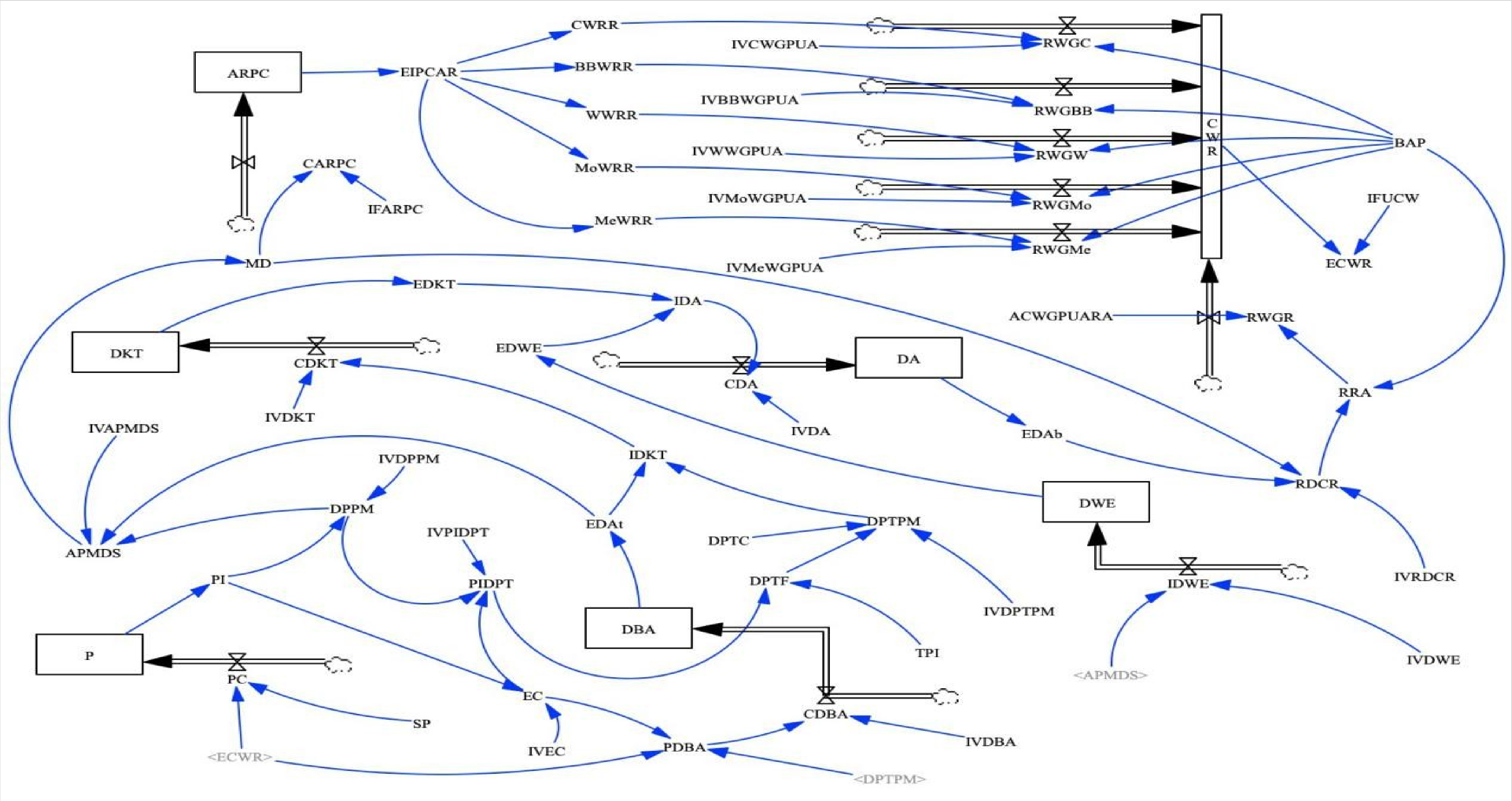
Stock-flow Diagram



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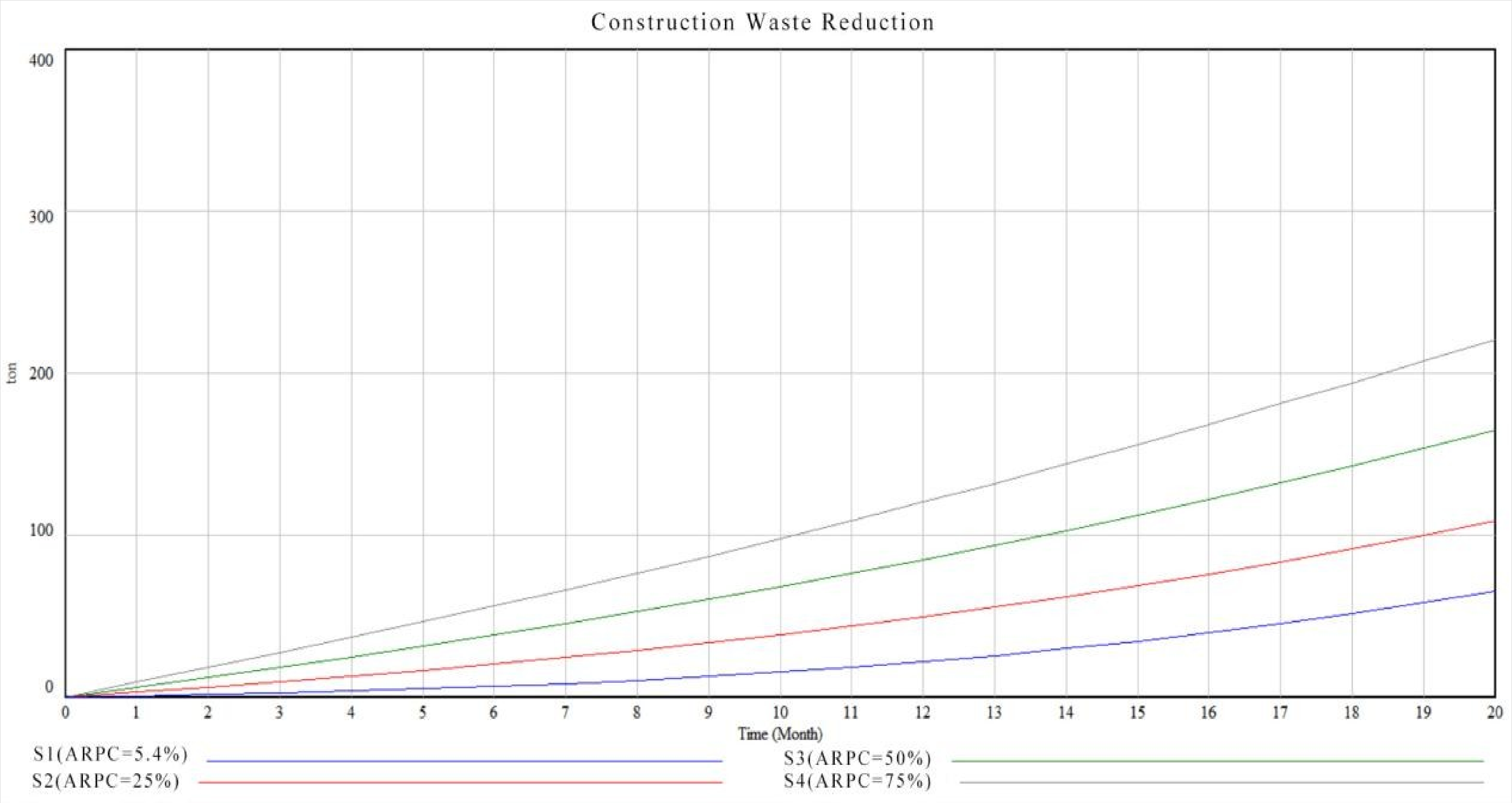
Model Verification: Extreme Condition Test



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Model Verification: Extreme Condition Test

Scenarios	S1(ARPC=5.4%)		S2(ARPC=25)		S3(ARPC=50)		S4(ARPC=75)	
	Reduction(ton)	rate	Reduction(ton)	rate	Reduction(ton)	rate	Reduction(ton)	rate
Concrete waste	0.27	6.1%	1.27	28.5%	2.55	57.3%	3.84	86.3%
Brick and block waste	0.019	6.1%	0.089	28.5%	0.179	57.3%	0.269	86.3%
Mortar waste	0.014	6.4%	0.067	30.4%	0.127	57.7%	0.191	86.8%
Metal waste	0.029	6.1%	0.136	28.%	0.273	57.4%	0.411	86.5%
Wood waste	0.049	6.1%	0.231	28.5%	0.464	57.3%	0.699	86.3%
Rework waste	0.053	4.9%	0.245	22.6%	0.493	45.4%	0.745	68.6%
Overall CW	12.04	22.6%	55.74	104.7%	111.4	209.2%	167.4	341.3%

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Results and Discussions

- Increase investment on professional training of designers
- Policies strengthen

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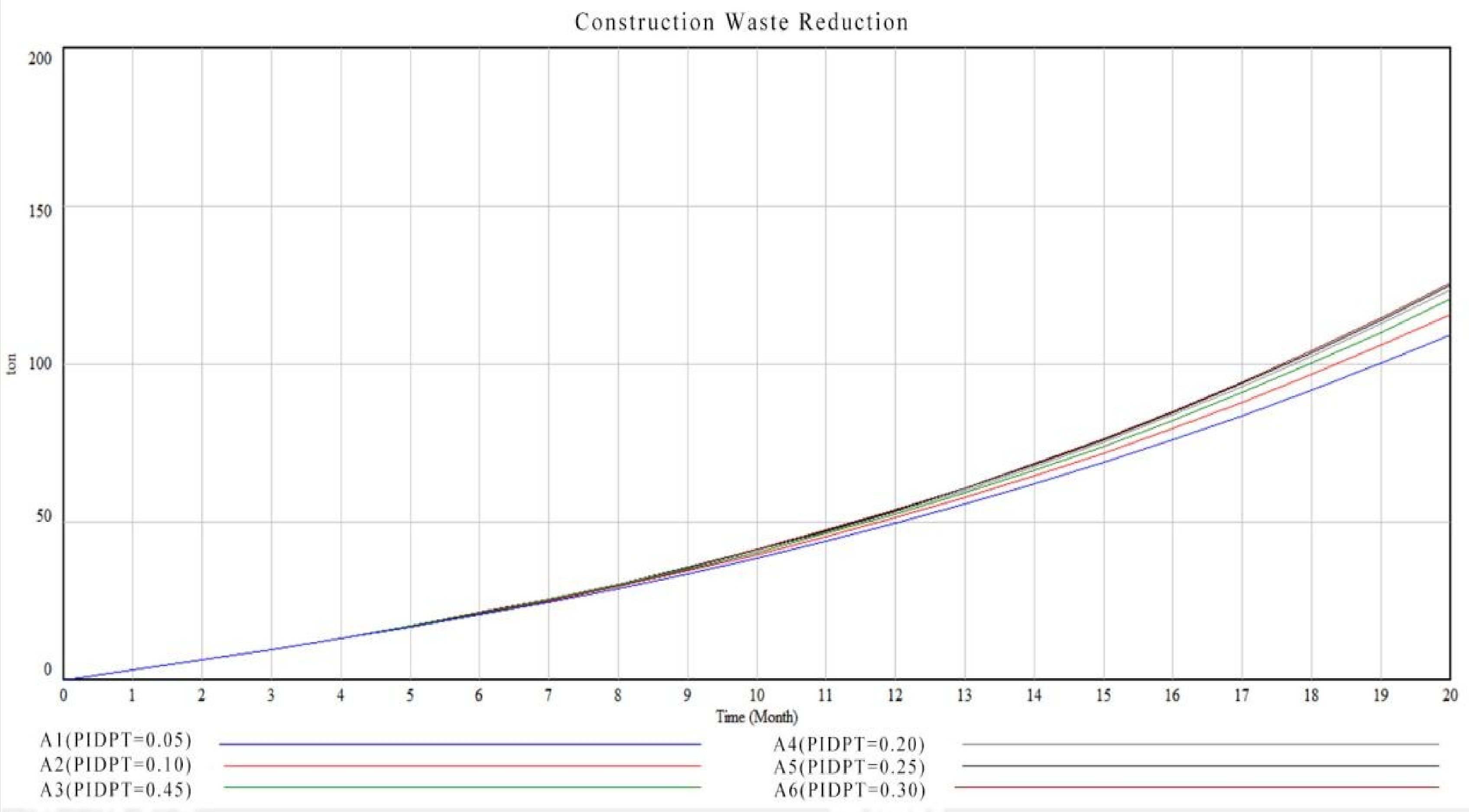
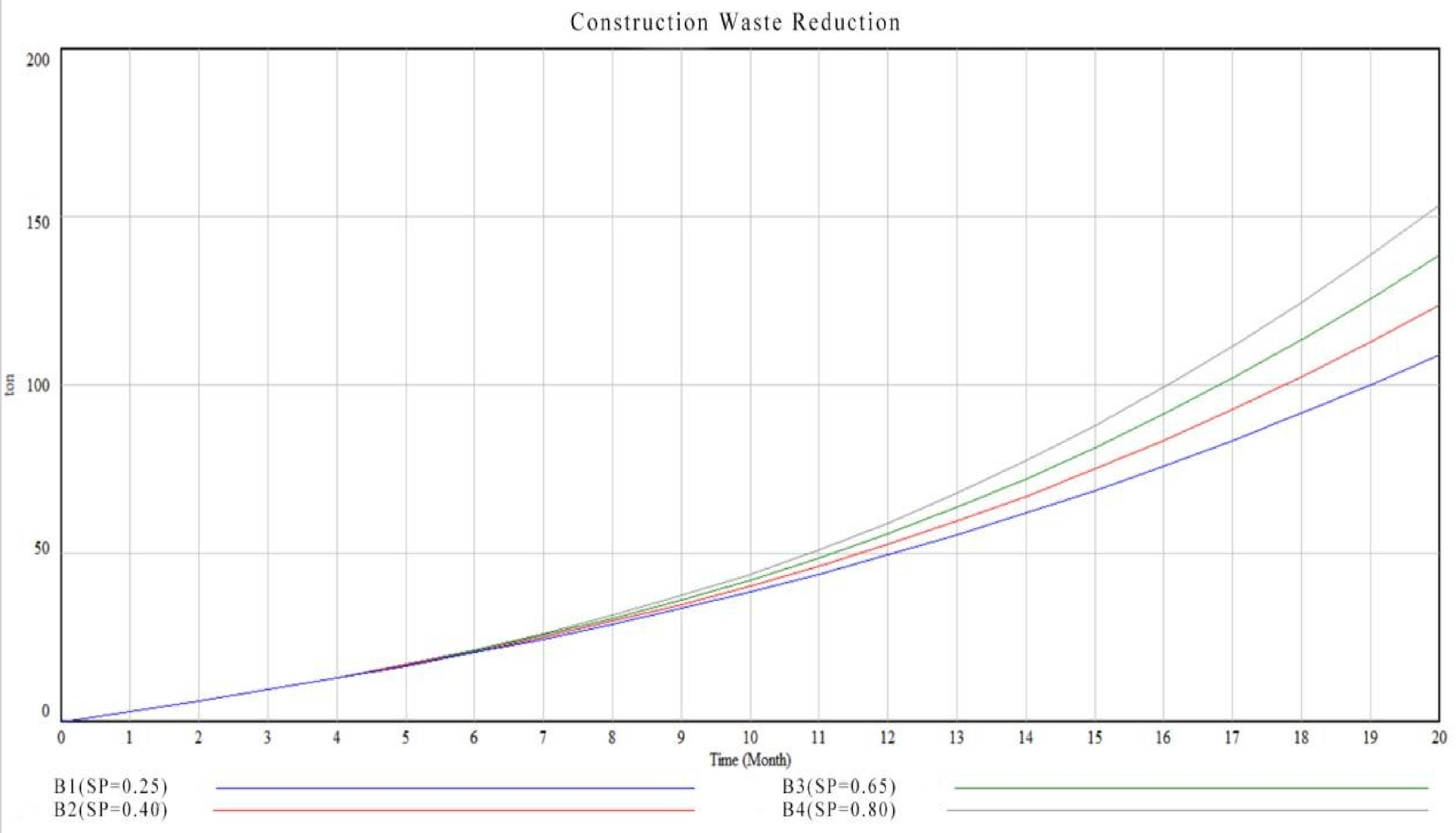
Professional Training of Designers



Policies Strengthen



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Conclusions

Conclusions

01 An increase in the value of prefabricated components exerts a strong effect on CW reduction especially for concrete waste during design stage。

02 Two strategies, increasing investment on designers’ professional training and strengthening policies, are efficient in promotion of prefabrication method and increase CW reduction during design stage.

03 Increasing the investment on designers’ professional training is not always useful as for the upper limit of designers‘ skills.

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THANKS FOR YOUR LISTENING!

Q AND A