

# ADVANCED ECONOMIC TOOLS FOR STRATEGIC WATER RESOURCE MANAGEMENT UNDER DROUGHT: A REAL OPTION APPROACH

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INTEGRATED DROUGHT MANAGEMENT PROGRAMME



## Introduction

### Background

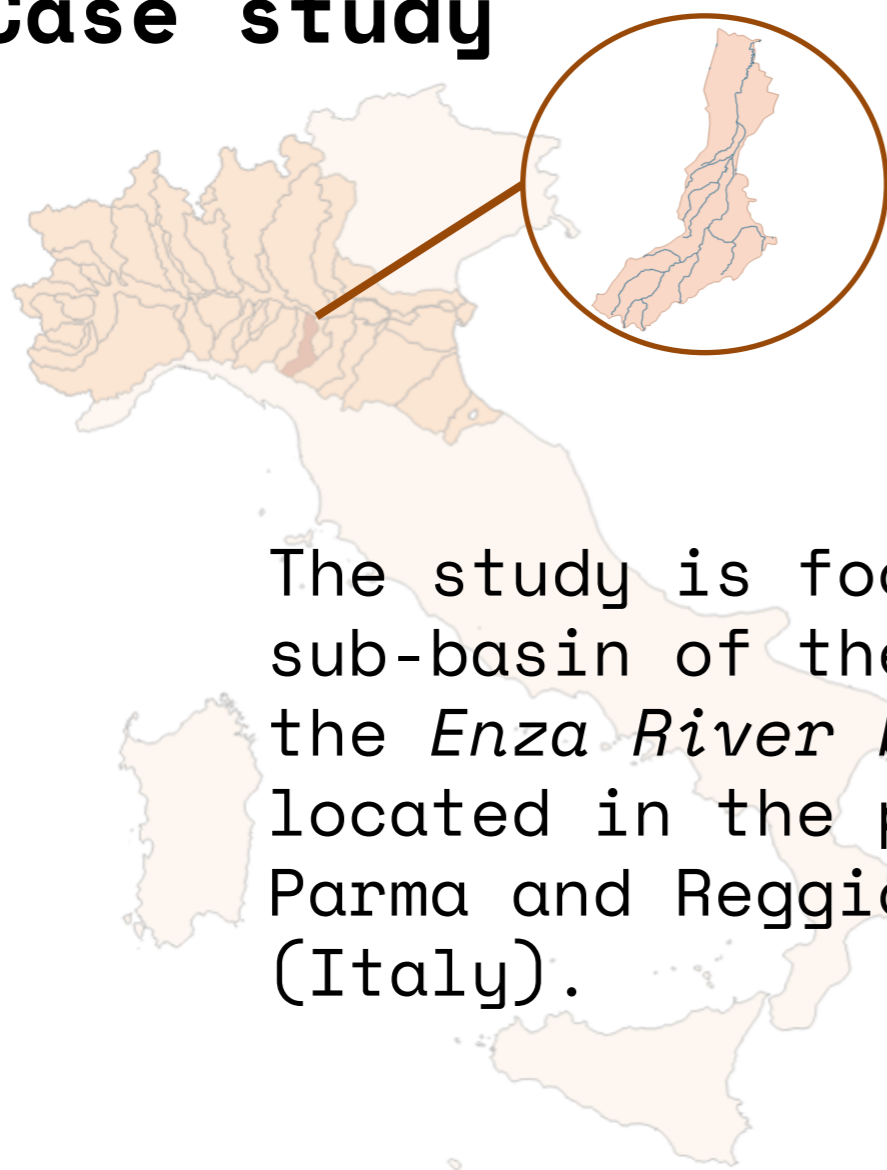
Economic analysis of public resources is crucial for supporting decision-makers and avoiding inefficient investments. Traditional discounted cash flow techniques are commonly used to analyse water infrastructure investments to face drought. However, these projects involve long-term planning, irreversibility, decision flexibility, and uncertainty, which traditional models often fail to fully account for.

### Objective

Developing an economic analysis model that incorporates uncertainty arising from future drought events.

## Methodology

### Case study



The study is focused on a sub-basin of the Po River: the *Enza River basin*, located in the provinces of Parma and Reggio Emilia (Italy).

STEP 1: **Cost-Benefit Analysis (CBA)** on infrastructures investment concerning various measures to face drought

STEP 2: Application of **Real Option Approach (ROA)** to CBA to evaluate the *deferral option*. The strategic option enables decision-makers to delay an investment while waiting for more favourable conditions or additional information when uncertainty concerning the investment is high.

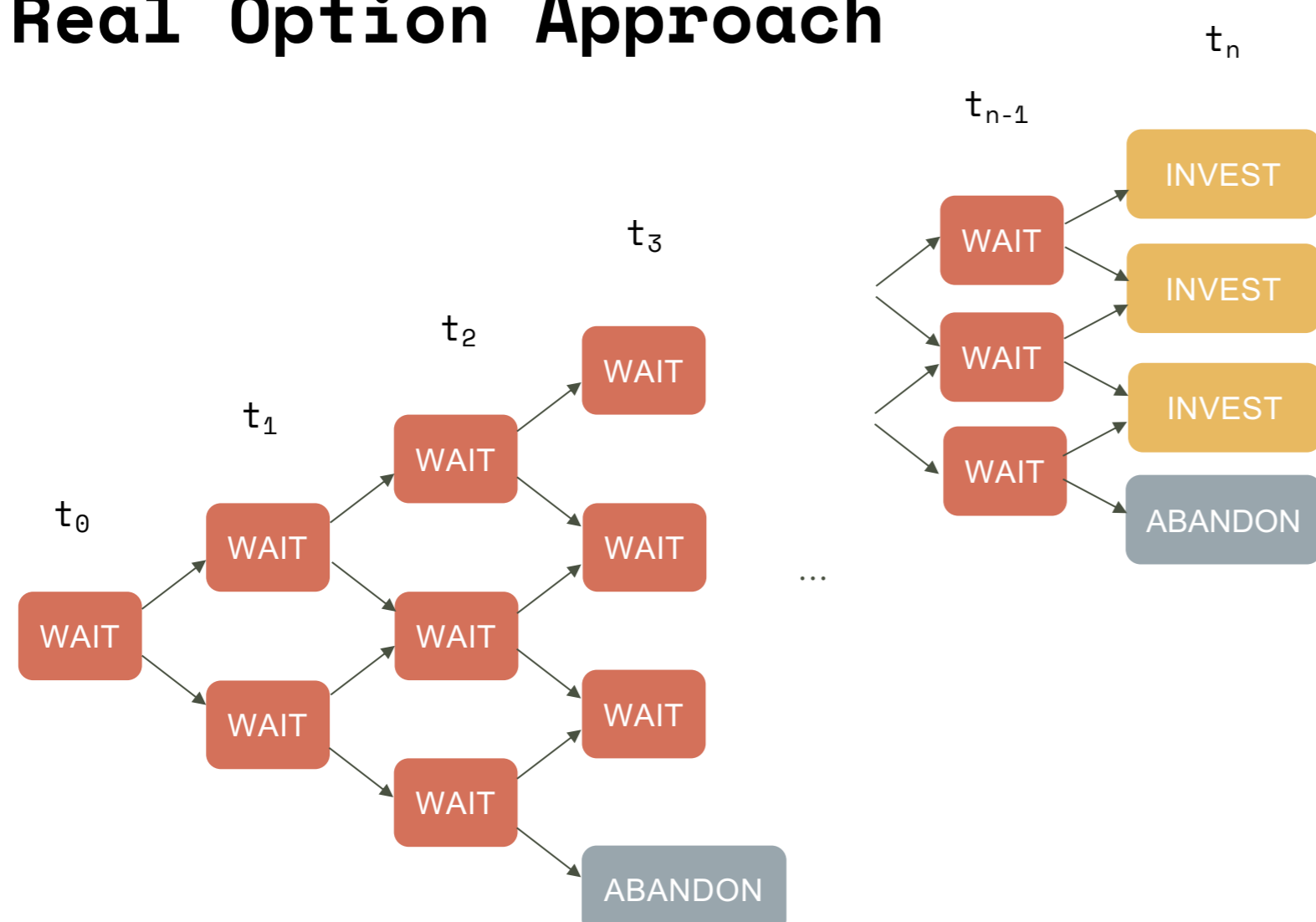
## Results

### Cost-Benefit Analysis

Social benefits of CBA were estimated in different climate scenarios. The net present value (NPV) of each scenarios shows that the investment is economically viable.

SCENARIOS	NET PRESENT VALUE (NPV)
<b>RCP 4.5</b>	+ 26.519.195,20 €
<b>RCP 8.5</b>	+ 108.049.635,74 €

### Real Option Approach



Results from ROA show that the value of the option to wait is greater than the value of the option to invest at time 0 ( $t_0$ ).

The binomial tree here shows that at time 0, the difference between the two option suggest to wait until the period of the life of the option, where it suggest to invest if the condition are favourable.

## Conclusions

### Take-home message

Results show that, even if the NPV is positive, the ROA suggest to delay the investment. Hence, it is better waiting to invest until more information is available.

### Major limitation

The main challenge in developing the model is estimating volatility, due to uncertainty about the most suitable values and limited data availability.

### Work in progress

Work is underway to expand the application of this model to a broader economic analysis encompassing various measures aimed at improving water resource availability throughout the Po River basin.