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Results-Based Financing Programs for Promoting Clean Energy Access in the Global South Considerations for Successful Implementation

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Results-Based Financing Programs for Promoting Clean Energy Access in the Global South

Considerations for Successful Implementation

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Abstract

Results-based financing (RBF) is becoming an increasingly popular tool for development cooperation in the energy sector to provide clean energy access in the Global South. The fundamental idea of RBF is that disbursements of subsidies are contingent on predetermined results. Although several programs have emerged in the sector concerning an RBF approach, limited research is executed on the development of these programs. Due to the importance of the transition in the Global South to clean energy access, the buildout of programs supporting this transition is urgently required. Therefore, this research paper aims to close an important research gap in the development of RBF programs in the energy sector by reviewing the literature that is available and adding to the literature by interviewing experts in the field of interest. On this basis, the paper derives key considerations for developing such an RBF program in the energy sector. Furthermore, all these considerations are structured in an analytical framework to increase the understanding of the development. In this framework, the considerations are divided into four sets of considerations that need to be followed in order to develop an RBF program. This results in a paper that provides a framework of considerations and overviews of each consideration to enhance the impact of RBF in the energy sector in the Global South.

Preface

“Van de maan af gezien zijn wij allen even groot.”

- *Multatuli*

For the first years of my life, I lived in the Philippines and learned already about the big differences all over the world. These differences are present between and within countries in status, wealth and well-being of people. Due to these significant differences, not everyone has equal chances, and not everyone is seen as equally important. Nevertheless, I also learned what Multatuli translates beautifully: “from the moon seen, we are all the same size”. This means that in the end, everyone is equally important. In the end, we all live on the same planet, and all together, we have an impact. Therefore, international development became one of my passions because I believe it is essential to not only focus on the most “important” parts of the world but distribute efforts more equally, also to areas such as the Global South.

Another passion that developed over the years was my great interest in the status of the climate and, subsequently, the energy transition. After signing the Kyoto Protocol in 1992, which aimed to reduce the CO₂ emissions, still, more than half of all CO₂ ever produced by humans was still released. I myself was born in 1998 and, therefore, part of the generation that grew up in this era of excessive greenhouse gas emissions. I, therefore, felt partly responsible for this global problem. However, I am also an optimist who likes to lead the way and actively wants to make a difference for sustainable change for the world and the people who live in it.

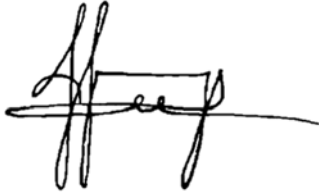
For this reason, I started my bachelor's "Sustainable Innovation" and later on the master's "Innovation Sciences" at the Technical University of Eindhoven. My passions for international development and the energy transition came together in my studies. This resulted in an incredible journey where my interest only deepened, my motivation enlarged, and my passions never left me. Therefore, I was very content to finish this journey with this master thesis where all different aspects could come together.

This all could not have been possible without the great help and support of others. Firstly, I want to wholeheartedly thank Henny Romijn, who has supervised me over the past months. Thanks to all the in-depth conversations, most valuable discussions and helpful feedback, she empowered me to explore and discover the world of results-based financing programs in the energy sector. These meetings were a driving force for this thesis, and I could not have a better supervisor to go on this journey with.

At the university, there are a few others I would like to thank. I would like to thank Arjan Kirkels, my second supervisor, for his very constructive feedback and support when needed, which helped to go the last mile. Also, I am very grateful for Jonas van der Straeten, who could step in as my third supervisor and make time for this research. Furthermore, I want to thank the honours academy and Heleen de Coninck for their support and guidance in exploring my path. And lastly, I am thankful for all the great lecturers and supervisors I had over the past years, who taught me so many lessons but, more importantly, kept inspiring me during all these years.

Besides the academic guidance I have enjoyed, I am deeply thankful to Carmen Heinze, who trusted me to conduct this research for the Netherlands Enterprise Agency. Also, I want to thank the whole team of “Mondiale Vraagstukken - Energie en Klimaat” (*Global Challenges - Energy and Climate*) for their openness, support and answers to all my questions. Moreover, I would like to extend my appreciation to all the experts who participated in this research for sharing their knowledge, expertise and insights about results-based financing in the energy sector.

Lastly, I am very grateful that Frederique Vogel, Kiki Dethmers, Sacha Slootheer, Martje Wijnen and Haye Frings were willing to proofread my report and help to bring it to a higher level. Also, I would like to thank all my family, friends and all others who supported me during my journey here. Thanks to you all, I am where I am, and you are my backbone no matter where I am in the world.

A handwritten signature in black ink, appearing to read 'Ayda Frings', with a long horizontal line extending to the right from the end of the signature.

Ayda Frings
April, 2022
Horst, the Netherlands

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Abbreviations¹**A**

AECF Africa Enterprise Challenge Fund

B

BGFA Beyond the Grid Fund for Africa

C

CCS **Clean Cooking Stove**
CDM Clean Development Mechanism
cVPP Community Virtual Power Plant

D

DAC Development Assistance Committee
DFID Department for International Development
DGIS Directorate General for International Cooperation (the Netherlands)
DIB Development Impact Bond

E

EnDev Energizing Development
ES Electric Stoves
ESMAP Energy Sector Management Assistance Program
ESP Energy Service Provider

G

GHG GreenHouse Gasses
GIZ Deutsche Gesellschaft für Internationale Zusammenarbeit

GOGLA Global Off-Grid Lighting Association

GPRBA Global Partnership for Result-Based Approaches

H

HAP Household Air Pollution
HDI Human Development Index

I

ICS Improved Cooking Stove
IEA International Energy Agency
IMF International Monetary Fund
IPCC Intergovernmental Panel on Climate Change
IVA Independent Verification Agent

K

KOSAP Kenya Off-Grid Solar Access Project
KPI Key Performance Indicator

L

LFA Logical Framework Approach
LME Local Medium Enterprise
LPG Liquefied Petroleum Gas

M

MG Mini-Grid
M&E Monitoring and Evaluation

N

NGO Non-Governmental Organization

¹ The abbreviations in bold are the key abbreviations of this research. The other abbreviations are used for organizations or for quotes in the appendices.

O

OCEF	Off-grid Clean Energy Facility
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development

P

P4P	Pay-for-Performance
PAYC	Pay As You Cook
PAYG	Pay As You Go
PBR	Payment-By-Result
PTA	Problem Tree Approach

R

RBA	Results-based Aid
RBF	Results-based Financing
RES	Renewable Energy Sources
REEEP	Renewable Energy and Energy Efficiency Partnership
RVO	Rijksdienst Voor Ondernemend Nederland (Netherlands Enterprise Agency)
R&D	Research and Development
RQ	Research Question

S

SDG	Sustainable Development Goal
-----	------------------------------

SDG7

Sustainable Development Goal 7 Results (program)

SHS

SIDA	Swedish International Development Cooperation Agency
SSA	Sub-Saharan Africa

T

TA	Technical Assistance
ToC	Theory of Change

U

UK Aid	United Kingdom Aid (program)
UN	United Nations
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNICEF	United Nations International Children's Emergency Fund
USAID	United States Agency for International Development

V

VBP	Vietnam Biogas Program
-----	------------------------

W

WB	World Bank
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Summary

Energy poverty is one of the key factors in many worldwide challenges, including climate change, health issues, inequality and poverty. It is the inability or unaffordability for individuals, households or communities to access adequate, reliable and safe energy to fulfil their basic needs in life. Mainly in the Global South, energy poverty occurs because people do not have access to clean energy sources and clean energy technologies, like solar home systems (SHS) and clean cooking stoves (CCS). Development cooperation programs are developed in these regions to reduce energy poverty and increase clean energy access. One of the mechanisms used for these programs is results-based financing (RBF). The fundamental idea of RBF is that disbursements of subsidies are contingent on predetermined results. While in many traditional programs, subsidies are disbursed at the start of a project, in RBF programs, subsidies are disbursed only when predetermined results are achieved. RBF programs are increasing in popularity. Over the past decade, several such programs have been set up, and it seems that more will follow.

Research Objectives

Although several programs have been developed and presumably more will follow, limited assessments of the application of RBF programs in the energy sector have been carried out. Moreover, due to the importance of the transition in the Global South to clean energy access, the development of programs supporting this transition is urgently required. Therefore, this research paper aims to close an important research gap in the development of RBF programs. Firstly, by aiming to investigate which considerations are essential to developing an RBF program in the energy sector and what these considerations mean. In each program, decisions are made on aspects of the development of a program, and the basis for these decisions are specific considerations. These affect the results that are coming out of a program and the objectives that it reaches. Therefore, it is essential to know what the considerations are that affect the program.

In relation to this, a structured, systematic research approach is desirable because that yields a comprehensive overview of the different considerations that are essential to be taken into account for the development of RBF. Unfortunately, no existing analytical framework appears to exist that could form a suitable starting point for this investigation, i.e. to give a systematic overview of all the different considerations for developing an RBF program. Therefore, this research also includes the development of an analytical research framework that helps structure the considerations which will be used for the objective above. In this way, the analytical framework fulfils a methodological function. Furthermore, such a framework would also add to the research field by structuring the knowledge about RBF in the energy sector, and it could provide guidance for principals² when developing an RBF mechanism.

The above research agenda leads to the following research questions:

Research Question 1:

What would be a suitable analytical framework for the analysis of considerations for the development of results-based financing (RBF) programs in the energy sector?

Research Question 2:

What do the considerations for the development of a results-based financing (RBF) program in the energy sector mean?

² A principal is the executor of a program and this is the stakeholder that is mainly concerned with the development of a program.

First, the first question needs to be answered. This methodological question provides a framework for the second question to work with. For the second research question, this research paper aims to provide an overview of and gain more knowledge on each consideration derived from the analytical framework.

Research Approach

The research questions have been approached through a systematic, multi-disciplinary methodology. This means different methods will be used in the research. Triangulation of the different methods makes it possible to identify different aspects of a phenomenon with greater precision by approaching it from multiple points of view than using one method. Furthermore, it helps to clarify and validate results obtained with other methods, develop theories about a specific topic and address research gaps found in other methods. This provides a more comprehensive and complete understanding of the research problem and a detailed and holistic view of the studied considerations. Moreover, it focuses more on developing the analytical framework used because it helps explain findings and causal processes.

The first method used is a literature review. A literature review provides insight into the current knowledge, theories, methods and gaps in existing research. The main aim of the literature review will be twofold. Firstly, the literature review will help establish an overview of the current knowledge available in the field of RBF in the energy sector. Secondly, conducting a literature review will help to enable to find out what research has already been done and identify research gaps. The following part of the methodology includes conducting interviews, which is a method of data collection. This data will be helpful to retrieve additional information from the existing literature, get more in-depth information and fill research gaps. Also, it complements the literature review. Different experts and stakeholders can be interviewed, which helps to view the research questions from different perspectives and be able to compare information between interviewees. A qualitative coding analysis will support the literature review and interviews. In a coding analysis, codes are ascribed to words, (parts of) phrases or multiple phrases. The goal of coding is to manage, filter and categorize the data and to get an inclusive overview of the data. This will help to construct a good analytical framework and get a clear view of what every consideration comprises.

Research Findings

The methodology results into multiple research findings. First, the first research question is answered by presenting the analytical framework. This framework answers the first research question because it provides a structured overview of the main considerations, chronologically orders the process of development of an RBF program, and provides an outline to zoom in on all the primary considerations of developing such a program. The analytical framework consists of four sets of considerations that need to be examined in chronological order to develop an RBF program successfully. Each examines a specific overarching topic of a set of considerations: desirability, suitability, feasibility and design. These sets form the basis of the rest of the research findings to answer together the second research question.

Therefore, first, the desirability is examined. The considerations of desirability examine the choice between RBF and traditional financing mechanisms of aid programs and are separated into three primary considerations: risk, flexibility, and achievement of goals. The difference in these factors results in the advantages and disadvantages of RBF. To a certain extent, an RBF mechanism can be seen as desirable because of the decrease in risk on the principal's side, the increase in flexibility on the agent's side, and the approach to reaching goals. But, on the other hand, there is an increase in

risk on the agent's side, principals do not always allow the flexibility the mechanism might give and the approach to reach goals also has its disadvantages.

If an RBF turns out to be a desirable tool for a principal, the program should also be suitable for the context in which it is implemented. Four main factors are needed to consider suitability: market development, additionality, market distortion and context maturity. Firstly, in market development, the second stage of expanding the market phase and the last stage of vulnerable households appeared to be most suitable. Secondly, to be additional, an RBF program has to be sufficiently solid, and new or more results need to be enforced. Thirdly, when market distortion takes place, the adverse effects need to be admissible to a certain extent and not outweigh the positive effects. And lastly, the context needs a balance in its maturity level. Too developed contexts might not require an RBF, but too undeveloped contexts might not have the suitable capacities.

For the feasibility, the most prominent stakeholders and their capacities were considered. In general, one or multiple donors, a principal, agents, and end-users are crucial and also the receiving government, verification agent and manufacturer play an essential role. All these stakeholders need to have the right capacities, like institutional, network or financial capacities. Also, these stakeholders need to fit together and need to have specific capacities in relation to other stakeholders. When these stakeholders and their capacities are not in place, an RBF is not feasible.

Finally, when a principal decides an RBF mechanism is desirable, suitable and feasible, the last choices are how to design the RBF mechanism. Therefore, considerations are important concerning finance, technology, time, selection and verification. These considerations are subdivided into a list of 18 sub-considerations. In these design considerations, it is not only essential to examine every consideration individually, but the composition of different considerations together is also essential to come to an effective RBF program.

To conclude, this study investigates the development of RBF and provides a framework consisting of four sets of considerations that examine the desirability, suitability, feasibility and the design of RBF. In this way, the research paper provides tools to make balanced decisions toward a good RBF program.

1. Introduction

1.1. Energy Poverty

Energy poverty, which is the inability or unaffordability for individuals, households or communities to access adequate, reliable and safe energy to fulfil their basic needs in life, is a key factor in many worldwide challenges, including climate change, health issues, inequality and poverty (Habitat, n.d.; IEA, 2017). The main aspects of energy poverty are the lack of access to electricity and clean fuels for cooking. Nowadays, 940 million people worldwide, which is 13 per cent of the world population, are still lacking access to electricity and 3 billion people, which is 40 per cent of the world population, lack access to clean fuels for cooking (Ritchie & Roser, 2020). These people mainly live in developing countries like Sub-Saharan Africa (SSA), where even 80-90 per cent of the households rely entirely or partially on biomass or kerosene as their primary energy source (Stritzke et al., 2021). The Sustainable Development Goals³ (SDGs) help to address worldwide challenges, and SDG 7 is essential for addressing the problem of energy poverty. It aims to achieve 'access to affordable, reliable, sustainable and modern energy for all' (Stritzke et al., 2021). In this way, SDG 7 aims to tackle energy poverty, but there is more. Climate change is another enormous worldwide challenge addressed by SDG 7. Climate change calls for an energy transition from fossil fuels and old inefficient technologies to modern and sustainable energy sources (Vanegas Cantarero, 2020). Both challenges might contradict when more energy usage (which combats energy poverty) leads to the increased usage of fossil fuels and inefficient energy technologies. However, when energy poverty is addressed with renewable, efficient and sustainable energy sources, the two challenges are able to reinforce each other.

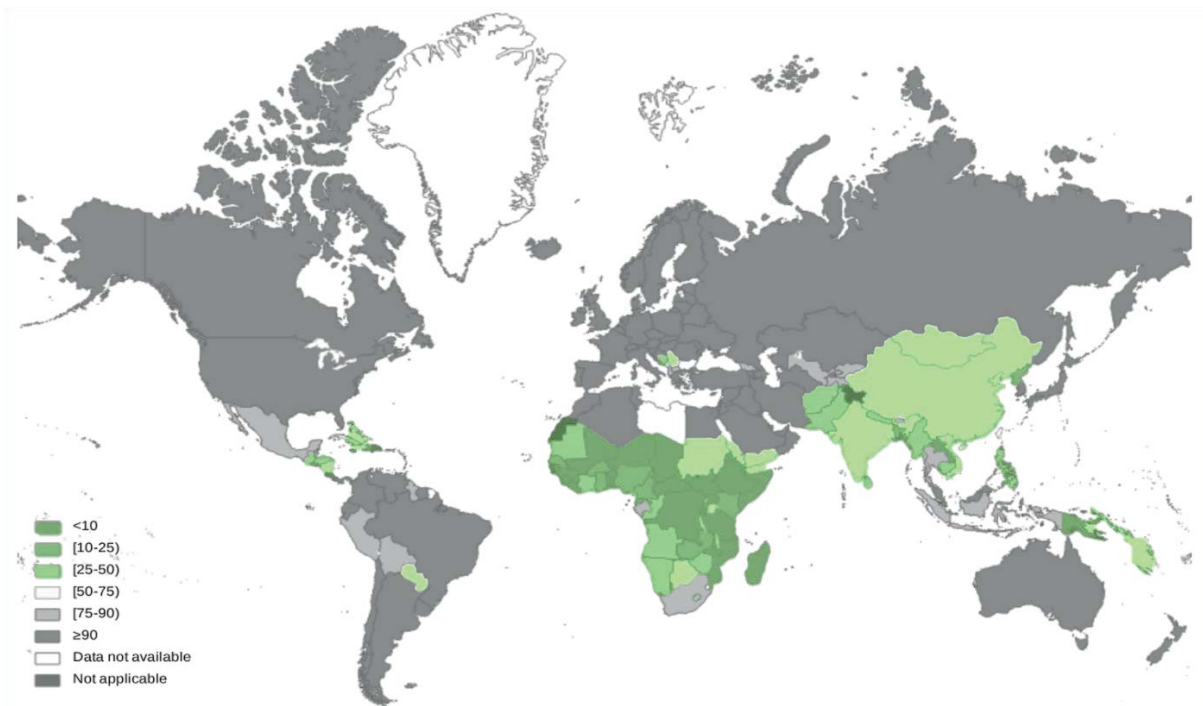


Figure 1.1. Proportion of population per country with primary reliance on clean fuels for cooking (%) (WHO, 2021).

³ The SDGs comprise 17 goals designed to be a "blueprint to achieve a better and more sustainable future for all", which have been adopted by 193 countries.

Developing countries are interesting because these face the highest level of energy poverty (see *Figure 1.1. for the percentage of energy poverty per country*), but also because these countries play a major role in the challenge of climate change since several of the developing countries have already a significantly higher share in the worldwide pollution emissions or are expected to face the highest growth in energy demand⁴ (International Energy Agency, 2021; Sharma et al., 2021). The importance of developing countries presents opportunities but also limitations. The size of the economies of developing countries presents an opportunity to make the implementation of cleaner and more environmentally friendly energy sources swifter. Also, the degree of technological advancement increased drastically over the past decades. Therefore, developing countries have access to technologies that did not exist in the past when the developed countries were at similar development stages (Bentham, 2015). Two of these technologies are solar home systems (SHS)⁵ and clean cooking stoves (CCS)⁶. Among others, access to these technologies makes it possible to combat energy poverty and climate change simultaneously. However, there are also many limitations. Economic, social, political, and cultural shortcomings restrict the transition to access affordable, reliable, sustainable and modern energy for all. To overcome these limitations, development cooperation is still vitally needed (Government of the Netherlands, n.d.; United Nations, 2017).

Development cooperation is an activity that aims to support (inter)national development priorities, is not driven by profit, discriminates in favour of developing countries and is based on cooperative relationships (United Nations (DESA) & UKaid, 2016). There are multiple ways, approaches and tools developed over the years to execute development cooperation, of which some involve subsidies. Subsidies represent an additional input of financial resources in the market, which allow the level of output of new technologies in a market to expand or might even create a new market. These are particularly relevant when these involve positive externalities. For example, when subsidizing renewable energy technologies, the greater output can also increase understanding of these technologies, which reduces future deployment costs. In this way, scale benefits lead to reduction in costs overall, which is beneficial for society as a whole (Grubb et al., 2021; Vivid Economics, 2013). Although development cooperation is seen as important, the amount of development cooperation is decreasing (Mitchell & Rogerson, 2020), and there is more and more pressure on budget allocations. Also, it is deemed important that the development cooperation improves in terms of effectiveness. Therefore, there is a renewed impetus to focus on results (Pereira & Villota, 2012). Consequently, one of the recently upcoming approaches is Results-Based Financing (RBF).

1.2. Results-Based Financing

Results-based financing (RBF) is a term that is also known under the terms performance-based financing (Canavan et al., 2008), payment by result (PBR) (Pearson et al., 2010), results-based aid or funding (Birdsall et al., 2010; Hüls et al., 2017), performance-based payment (PBP) (C. Eldridge & Palmer, 2009), pay-for-performance (P4P) or cash on delivery aid (Stritzke et al., 2021). The term is used for any program that provides subsidies, like the transfer of money or material goods, after achieving and verifying a predetermined performance output. This means that in a results-based financing scheme, there is a (contractual) agreement on this predetermined output before the start of a project between a principal, which is the developer and executor of a program, and the agent,

⁴ For example, in 2021, the energy demand is set to grow by 4.6 per cent in 2021, and almost 70 per cent of the increase is coming from developing countries (International Energy Agency, 2021).

⁵ A solar home system is stand-alone photovoltaic system that offers power for appliances. In rural areas, SHS can be used to fulfil basic electric needs and meet a household's energy demand without connection to the electricity grid (Salas, 2017).

⁶ A clean cooking stove is a household stove that reduces polluting and harmful emissions by e.g. reducing specific emissions, increasing thermal efficiency or increasing ventilation (Renewable World, 2019).

which is the beneficiary of the program. When this predetermined output is reached, the principal will transfer the reward to the agent. An example of the output in the energy sector is a specified number of distributed clean cooking stoves (CCS). (J. D. Lee & Medina, 2019; Oxman & Fretheim, 2008). This approach differs from traditional aid financing, where aid subsidy is given in advance before the beginning of a project in order to finance inputs and activities that are expected to produce specific results (Sida, 2015).

RBF has become an increasingly popular tool to support development projects over the past years. At first, mainly health projects were supported by RBF starting in the early 2000s (Grittner, 2013). Therefore, most research documents about RBF are based on the health sector. Later on, also other sectors became interested in RBF and started to utilize RBF as a financing support tool. One of the recent sectors is the energy sector, where it o.a. supports SDG7. There is not a clear starting point, but in 2010 already, some programs were running. For example, in the World Bank (WB), RBF programs were run in 30 different countries and also several additional programs outside the WB. Among them were projects funded by the Energizing Africa initiative of the Netherlands Directorate-General for International Cooperation. All these programs focused mainly on SHS, but gradually CCS became included (Kumar & Mumssen, 2010). Nowadays, RBF is still gaining ground in the energy sector, but is still lacking in terms of proof of concept. Because RBF is an innovative financing instrument, research about the mechanism and its effectiveness is still limited. Therefore, it is interesting to learn more about RBF. This formed the starting point for this thesis.

One organization that practices RBF is the Netherlands Enterprise Agency (RVO). RVO supports entrepreneurs, organizations, NGOs and knowledge institutes by enhancing entrepreneurship, realising international ambitions and strengthening positions (RVO, n.d.-a). RVO works on different programs in the energy sector with an RBF component, like the programs Energising Development (EnDev) or SDG7 Results. SDG7 Results aims to provide 2 million poor people with a connection to modern energy services, like CCS and SHS. The program aims to do this by providing private organizations and NGOs with a financial incentive to mitigate risks in the energy market and reduce costs. Also, the program aims to contribute to low-carbon, climate-resilient development, reduced inequality, private sector development and mobilization of private investments in climate. Because of the ongoing RBF program, RBF developments, especially in the energy sector, are an area of interest for RVO. Because of the limited research in this area, RVO asked to execute research project about RBF programs in the energy sector. Especially, gaining more knowledge and understanding about the considerations that are essential to the development of these programs is of significant importance for the organization to improve current programs or develop new ones.

1.3. Research Scope

In August 2021, Stritzke et al. made the first attempt to close a part of the research gap with a paper on RBF for cookstove projects. Although it gives a good insight into CCS, it does not include other energy technologies like SHS, which is another essential technology to SDG 7. Also, more importantly, while it derives lessons about the global scaling of RBF projects, the next step to what these lessons imply for the development of programs is not always taken. Other literature available on the considerations that are essential for the development of RBF is not only limited but also scattered and segregated in the field of study. This results in a field that is hard to grasp, making it hard to learn about the development of RBF programs. So, additional research that gains more knowledge on the nature of the considerations essential to the development of RBF programs is indeed needed.

Therefore, this research paper will focus on two aspects. Firstly, the paper focuses on investigating which considerations are important to developing an RBF program in the energy sector. In each

program, decisions are made on aspects of the development of a program. These affect the results that are coming out of a program and the objectives that it reaches. Therefore, it is essential to know what the considerations are that affect the program. In relation to this, a structured, systematic research *approach* is desirable because that yields a comprehensive overview of the different considerations that are essential to be taken into account for the development of RBF. No existing analytical framework appears to exist that could form a suitable starting point for this investigation, i.e. to give a systematic overview of all the different considerations for developing an RBF program. Therefore, this research also includes the development of an analytical research framework that helps structure the limited and scattered information available and provides an overview of the considerations. In this way, the analytical framework fulfils a methodological function. Furthermore, such a framework would also add to the research field by structuring the knowledge about RBF in the energy sector, and it could provide guidance for principals when developing an RBF mechanism.

The above research agenda leads to the following research question:

Research Question 1:

What would be a suitable analytical framework for the analysis of considerations for the development of results-based financing (RBF) programs in the energy sector?

When this question is answered, the considerations considered and the analytical framework of these considerations are known. Then the next step is that every consideration needs an explanation of what it comprises. This is the second aspect focussed on in this research: each individual consideration. The research paper aims to provide an overview of and gain more knowledge on each consideration derived from the analytical framework, e.g. lessons from experiences with other RBF programs can help when developing new programs. The overview of the different considerations will help principals to make these different aspects explicit and make the right decisions when developing a program. The second research question is the following:

Research Question 2:

What do the considerations for the development of a results-based financing (RBF) program in the energy sector mean?

To answer this second question, it is vital that first, the analytical framework is developed, and subsequently, the analysis of each individual consideration can occur. The result of this first research question will help to answer the second research question. In this way, the first question is methodological for the second research question.

Besides its academic and theoretical value, this research will be mainly relevant to so-called principals. This entity faces the full range of considerations and might use the analytical framework. Because a structured overview has been lacking in the field thus far, the developed framework can help principals develop an RBF mechanism in an ordered and inclusive way. Furthermore, because the principal assesses the development of an RBF program, this is the primary point of view taken in this research paper. However, it might still be interesting for other stakeholders as well, to learn about the working of these RBF programs.

The research questions will be answered in the following chapters. Firstly, in **Chapter 2**, the theoretical background of the research will be introduced. It holds the description of the used theories and the concepts and contains the explanation of the methods that are needed to understand the results sections. Afterwards, in **Chapter 3**, the methodology adopted in the research is explained. Then in **Chapters 4, 5, 6, 7 and 8**, the research results will be presented with the help of a literature study and

interviews. First, in Chapter 4, the first research question will be answered, and subsequently, in chapters 5, 6, 7 and 8, the results for the second research question will follow. **Chapter 9** will make conclusions on the research and contains the answers to the second research question. Finally, in the last chapter, **Chapter 10**, the findings are discussed, there will be reflected upon the research approach and recommendations for further research will be given. The different chapters and their relation to each other are shown in figure 1.2.

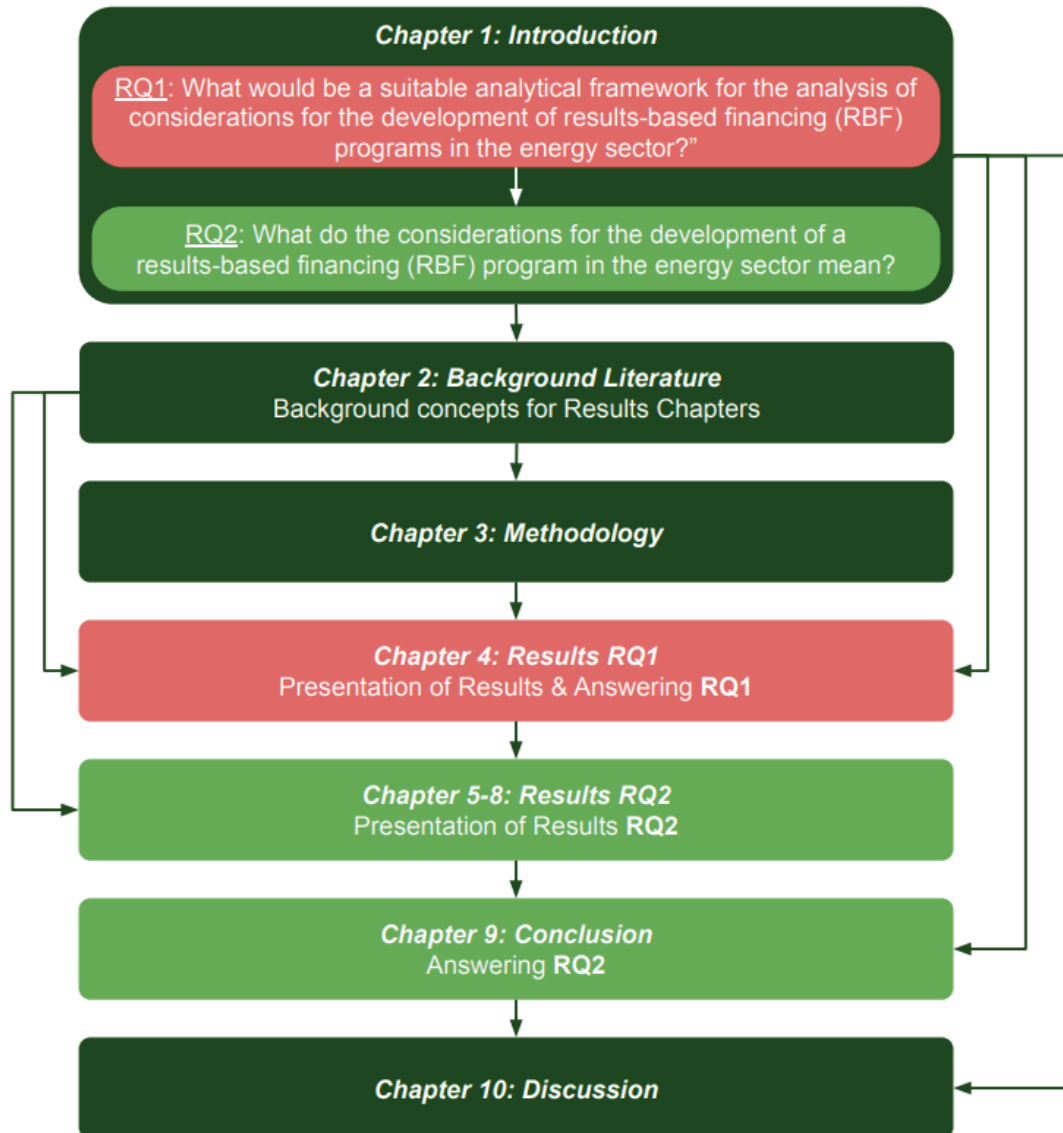


Figure 1.2. Overview of chapters in the research paper.

2. Background Literature

This chapter presents the background literature for the research. A background literature explains concepts and theories relevant to the research (Bibri, 2015). Therefore, in this chapter, some core concepts and theories that are important to the research will be discussed. These are the principal-agent relationship, the program cycle and the theory of change. The aim is that these core concepts underpin the research and clarify concepts coming forward in the results chapters.

Firstly, two fundamental concepts will be explained: the principal and the agent. The principal and the agent are two crucial entities that play a central role in an RBF mechanism. These concepts will come back in each of the chapters, and also their relationship is significant to an RBF mechanism. Furthermore, as mentioned in the introduction, the primary lens used is the lens of the principal. Therefore it is of extra importance that this concept is understood well to understand the point of view taken. Therefore, this is the subject of another subsection of the background literature.

Secondly, the program cycle will be discussed. The program cycle shows a fundamental process of a program from start to end. This report will look into one specific phase of the program cycle. However, understanding one of the phases is also crucial to understanding the other phases of the program cycle. For example, for understanding the sets of considerations when designing a program, it is important to know something about the execution phase for which it is designed. Furthermore, the RBF process has some unique aspects which make it different from other programs in this respect. This distinction is vital. For example, it is crucial for understanding why an RBF program would be desirable. Therefore, this chapter will give insight into the program cycle and moreover, the program cycle typical for RBF.

Lastly, the theory of change and the results-chain theory needs explanation. The theory of change is a well-known theory in the field of interest. The results chain is a visual tool of the theory of change that explains the process of a project or program. It consists of five parts, starting from the input, going to the activities, output and outcome and ending with the impact. An RBF program has some distinctive characteristics when placing it into the results chain, which is essential to this research report. Therefore, also this theory will need to be explained.

So in this chapter, background literature will be provided, which is crucial to understanding the following chapters of the report and answering the research question.

2.1. Agent-Principal Relationship

The first concepts that need more explanation are the principal and the agent. The principal and the agent are two key concepts in the report and, as mentioned before, will come back in each chapter. Especially in chapter 7, the understanding of these concepts is crucial. This chapter will go more in-depth on the stakeholders in an RBF program and the principal and the agent part of these.

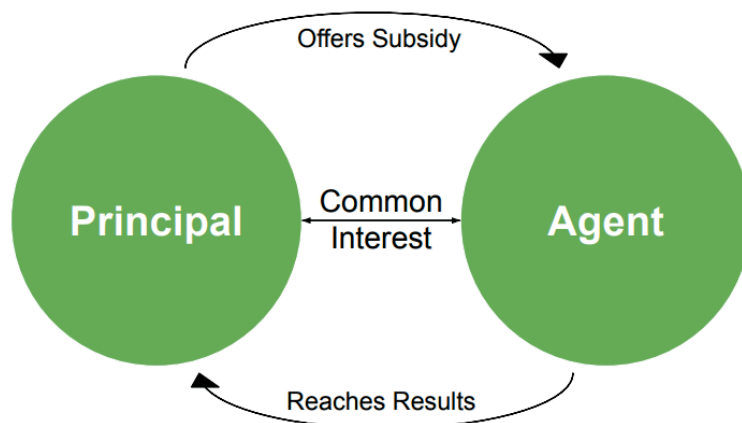


Figure 2.1. Principal-Agent Relationship (based on (Fox, 2019)).

As mentioned before, the principal is the executor of the program, while the agent is the executor of one of the projects that fall under the program. This shows immediately the relationship between the two entities: the principal subsidizes the agent. The aim of this subsidy by the principal is that specific objectives of the principal are reached by the agent. An agent is incentivized by this subsidy to reach these objectives (see figure 2.1.) (Fox, 2019). An example of a principal-agent relationship is when a principal has the objective to provide access to clean energy for an x amount of people who do not have access at the moment. Because the principal itself does not have the abilities to execute the activities itself or aims to empower others to do so, the principal delegates these tasks to an agent. The agent is incentivized to reach these goals because the agent gets a subsidy from the principal, for example, for every person that gets access to clean energy until x people are reached. In this way, the goals of the principal and the agent are aligned. One form of subsidy is an RBF subsidy (Baker, 2019).

Both entities also have other responsibilities. Principals have a wide range of responsibilities. Other responsibilities of a principal are that a principal, e.g. arranges the donor's funds, creates the design and structure of the RBF and aligns stakeholders. Therefore, the principal has a central position in the context of an RBF program (Baker, 2019; Fox, 2019). An agent, on the other hand, e.g. arranges the technology or service that will be provided to a customer and creates awareness in the target group. In most RBF programs, multiple different agents together form the stakeholder. Although both have other responsibilities, the relationship between the principal and the agent plays a central role and therefore, agents and principals play a central role in this research paper (Shah, 2014).

The principal and agent have a common interest in reaching predetermined goals because the principal subsidizes the agent for these goals. Nevertheless, at the same time, each is also focused on its own self-interest and its own acceptable risk. Therefore, a challenge of aid is the principal-agent problem (see figure 2.4.). A principal-agent problem results from a situation in which the principal delegates work to the agent who performs that work, but there is a conflict of interest (Baker, 2019; Fox, 2019). In that situation, the agent has the ability to make decisions and take actions within the project. This does not necessarily have to be a problem, but when the agent is motivated to act in its own interests instead of aligning these interests with the principal or the acceptable risk is exceeded, the principal-agent problem occurs. For example, this is the case in a situation of information

asymmetry. Information asymmetry is a condition when one party has more information than the other. This could result in a situation where the agent has more information and acts upon this information by aiming for a different goal than the principal. When this comes forward, it results in a conflict of interests, and the agent-principal problem occurs (Shah, 2014).

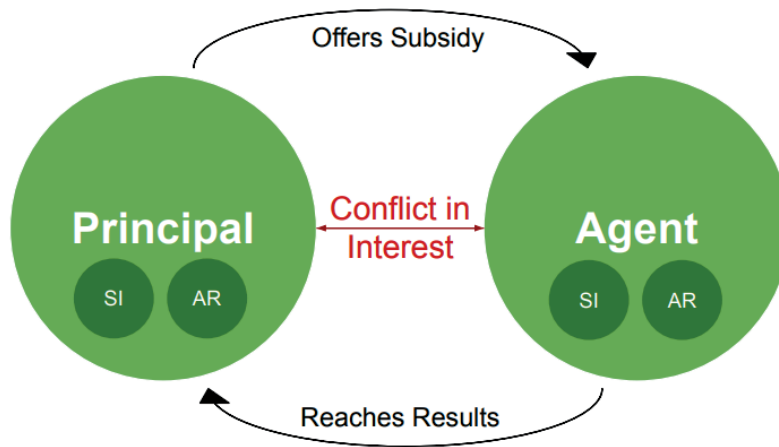


Figure 2.5. Principal-Agent Problem (SI → Self-Interest, AR → Acceptable Risk) (based on (Fox, 2019)).

2.2. Program Cycle for RBF

The program cycle is important because it indicates which part of the process of a program this paper is focusing on. Furthermore, while this paper focuses on developing an RBF program, it does not mean the other parts of a process are not important. The different parts of this process are interrelated, so not only the development but also the other parts should be understood. Especially in chapters 5 and 8 will be referred to other steps of the process of a program. However, in other chapters of the results, understanding the process is important too.

We can view RBF as an instrument that targets projects that form part of a development cooperation program. A development cooperation program consists of a framework of related projects with a theory of change aiming at a particular long-term development goal (Mueller et al., 2011). When researching the literature, there are many ways to look at development programs. In general, three different phases can be distinguished: identification & program design, project development & implementation and monitoring & evaluation. These phases can be found in Figure 2.3. (Hojckova, 2015; USAID, 2020).

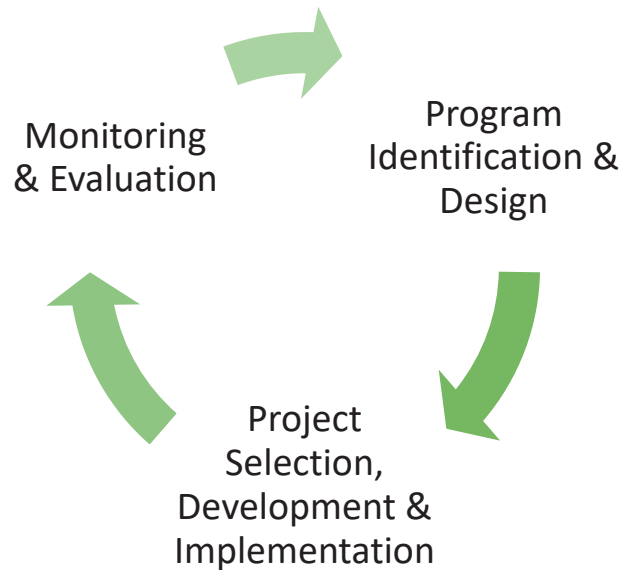


Figure 2.3. Interpretation of the development cooperation program cycle (based on (Hojckova, 2015; USAID, 2020)).

The first phase is program identification and design. This phase will be the focus of this research paper. The phase consists of two parts, the identification and the design of the program. Firstly, identification refers to the identification of the particular problem the program aims to solve (Hojckova, 2015; USAID, 2020). The problem results in a long-term development aim of the program and the start of the theory of change, which will be explained in Chapter 2.3. Theory of Change. The theory of change can help to specify the focus, like the aimed area or the specific sector. In this way, this phase helps the second part of this phase, the program design (Mueller et al., 2011). In the program design, the what, who, when, how and where of the program are chosen, and other design factors are made explicit. A program design does not contain specific details on the activities but only the essential focus points that will form the limitations of projects to fit in the program (Cracknell, 2000). Therefore, the program can be seen as a framework for different projects to be developed and implemented.

Secondly, the program is rolled out, and the projects are selected, developed and implemented. Projects are the activities of a program that bring the aim of the program into action. This phase is central to the aim of the program because, in this stage, the program and its projects are going from the theoretical phase of identification and design to the practical stage of execution. Therefore, many lessons are learned which could not be foreseen in the theoretical stage. The lessons of this stage are crucial to contribute to future RBF programs (Cracknell, 2000). These lessons are made explicit in the next stage: monitoring and evaluation.

Monitoring and evaluation (M&E) is the last phase of development programs. M&E is an approach used to measure and assess the performance of projects and programs with the overall purpose of effectively managing the outcomes and outputs of results (UNDP, 2002). The concept consists of two parts. First, there is monitoring. Monitoring is a continuous assessment aiming at providing the stakeholders with direct information about the progress in the achievement of results of the ongoing activities (UNDP, 2002). It gives an insight into the implementation phase of the activities. To be able to monitor, first, the evaluation indicators already need to be decided upon in the design phase, and then these indicators are monitored during the activities. The second part is the evaluation. This is a systematic and objective examination based on the monitoring results of the indicators concerning the effectiveness of the specified goals. The aim is to avoid repeating errors and promote successful

mechanisms in future projects (UNICEF, n.d.). Therefore, this phase leads to learning, which might adapt other phases. This means the development of a program is not a linear process, but all these phases move through cycles of redesign to generate more effective projects addressed by the program. This stage is essential to this research because it gives insights into the lessons (Cracknell, 2000).

While the program cycle above is a general cycle for all programs, the cycle can be elaborated specifically for RBF (Stritzke et al., 2021). As mentioned before, in the first phase, the program identification and design will be the focus of research in this report. There will be an elaboration on the differences compared to other programs, the stages within this phase, and many more aspects of the program identification and design. However, the other stages, the execution and the monitoring and evaluation of an RBF program, include some crucial aspects essential to understanding the first step. For example, the following steps are vital to the design. The design setting will determine what these next steps will look like, e.g. the tools used in the verification process. These steps are discussed before diving into the first stage.



Figure 2.4. Steps of program cycle in RBF (dark green steps are typical program steps and light green steps specifically for RBF) (based on (Cracknell, 2000; Hüls et al., 2017; Stritzke et al., 2021)).

To clarify the aspects of an RBF program, the phases are divided into steps, which are derived from different sources on RBF (Cracknell, 2000; Hüls et al., 2017; Stritzke et al., 2021; USAID, 2020). The first step is the identification & design step, which will be elaborated further in the following chapters

of the report. After identifying and designing the RBF program, six other steps can be typically distinguished. The second step is, just like in other programs, the selection of the projects. In this step, the principal selects the projects that fit into the program and which will be subsidized if predetermined targets are met (Cracknell, 2000). Then the third and first distinctive step will take place. In this step, agreements are made upon the targets of the program (Stritzke et al., 2021). What makes it unique is that when the activities and goals are determined, the principal will disburse an upfront subsidy in many programs. However, in RBF, agreements are made, but these are agreements on targets that must first be reached to retrieve disbursement. Examples of targets are a certain number of SHS or CCS systems sold. Therefore, the disbursement is allocated to a further place in the chain (Hüls et al., 2017). Fourth, without pre-funding by the program, the project is implemented, and activities are executed. The change in this phase is that the input for this execution does not include any pre-financing from the subsidy. Only once the pre-agreed milestones are reached claims for disbursement can be submitted (Cracknell, 2000; Hüls et al., 2017).

This leads to the next phase of monitoring and evaluation and, therefore, to the fifth step. The fifth step is also a typical step for RBF. In this step, the predetermined targets are said to be reached. Subsequently, these are verified by an (independent) verifier (Stritzke et al., 2021). Based on the results found by the verifier, disbursement of the funds is activated. The disbursement of the funds is the sixth step (Stritzke et al., 2021). Although disbursement is not typical for RBF, as mentioned before, the moment of disbursement is typical. Lastly, the projects and the program itself are monitored and evaluated. Because monitoring is inherent to an RBF mechanism, this is already (partly) done. The typical steps of RBF can be seen in Figure 2.4 (Escalante & Orrego, 2021). In light green, the typical steps for an RBF are distinguished from steps that might also be part of another financing mechanism.

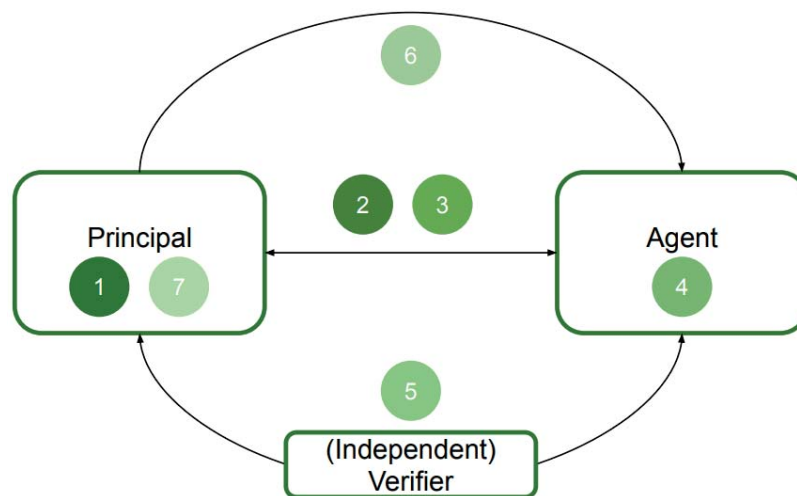


Figure 2.5. Steps of the program cycle of RBF taken by each stakeholder.

The stakeholders of the previous chapter play a crucial role. Therefore, for each actor is shown its involvement in particular steps in Figure 2.5. The steps are mainly executed by the principal, the agent or in an interaction between those. This figure shows that the main stakeholder involved in the first step is the principal. This

2.3. Theory of Change

The last important concept explained is the theory of change and, subsequently, the results chain. These are well-known concepts in the field of interest. These concepts will help to differentiate RBF from other mechanisms. These concepts are referred back to in chapter 5.

The last conceptual ingredient explained in this chapter is the theory of change. A *Theory of Change* (ToC) is a statement that consists of assumptions about how and why a program is assumed to lead to the desired result. In general, the ToC consists of a sequence of assumptions, in which each assumption in the chain brings the theory closer to the desired end result of the program (Grove, 1988). These assumptions are often profoundly held perceptions, or these should be based on facts and evidence (RVO, n.d.-b). A *results chain* is a graphic representation of a theory of change. A results chain is a linear tool that shows how project stakeholders believe that the logical relationships in a project between the different parts lead to a sequence of results (Funnell & Rogers, 2011; Kinyuira & Kenyatta, 2019). An example of the results chain can be seen in Figure 2.6.

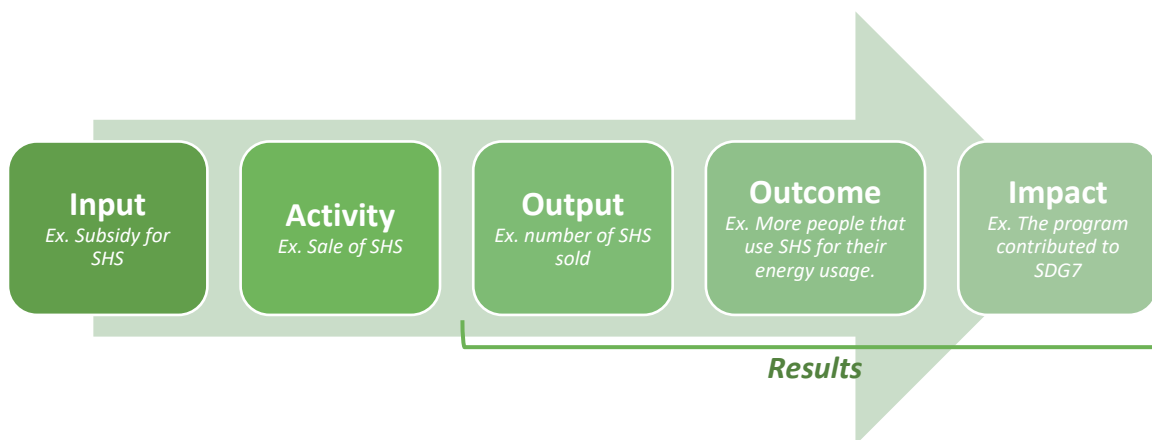


Figure 2.6. Result-chain including an example of results-chain of SHS (based on (Kinyuira & Kenyatta, 2019)).

As shown in Figure 2.6., the chain consists of five parts. Firstly, there is the *input* part of the results chain. These are all the resources that are used to implement a project and put the activities into action. Examples of these inputs are knowledge, funds like subsidies and human capacity. This leads to the activities, which is the second part of the results chain. These are the actions or interventions undertaken by a project which transform the inputs into outputs (Kinyuira & Kenyatta, 2019). Examples are the training of technicians to implement an SHS or the sale of the systems. This all leads to results. *Output* is the first level of results in the results chain. This level consists of the direct results of the activities, which are delivered during the program's implementation and are primarily in control by the program. With the correct input, the output can be largely guaranteed. Output is delivered if an organization or a group of people have improved skills, systems, capacities, systems, etc. or if something is created, sold, built or repaired (Foundations of Success, 2007). An example of the output can be the number of SHS delivered to society. Outputs result in the next level of results which is the *outcome*. Outcomes are medium-term results, and in most cases, the output implies a behavioural or performance change. While outputs are in direct control of the project owner, outcomes are less controllable and ultimately go beyond the program owner's control. An example is the increased number of people using the SHS. While the assumption can be made that once someone buys an SHS, this leads to the usage of the SHS, this is ultimately in practice not in the control of the program owner. This example shows how an output leads to an assumed outcome. Eventually, the outcomes lead to the last level of results: the *impact* (Foundations of Success, 2007; Kinyuira & Kenyatta, 2019). While

outcomes generally still affect the people and organizations in the program and maybe its direct surroundings, the impact goes much broader than the program itself. Therefore, impacts cannot be detected immediately but might only be detectable after months or even years. When these are detectable, these can be detected as changes in people's lives, which is aimed to be positive. Typically these changes are economic, cultural, social, technological, institutional or environmental. Examples of ultimate impact goals are the SDGs and, in the case of SHS, the contribution to SDG 7 (*Foundations of Success, 2007; Winderl, 2020*).

The results chain is the simplest way to represent a ToC, but there are also other ways to represent the theory of change, like a log frame, M&E framework and results framework. The most crucial difference is the way and the complexity of the representation. However, overall, all are extensions of the results chain. A theory of change can be helpful in different phases of a program because the ToC is able to monitor and evaluate the effectiveness of a program (*Foundations of Success, 2007*). Based on the ToC and its result chain program, suitable indicators can be derived to show if the intended results are achieved. Therefore, it gives insight in how a program should be constructed and designed.

In the RBF mechanism, the results chain plays an important role. The importance of outputs and outcomes increases because of the increased emphasis on these. Only when results are achieved the funds will be disbursed. The shift in focus affects the other blocks in the chain as well. Furthermore, there might be a challenge of goal displacement. Goal displacement is the phenomenon in which the focus of efforts becomes displaced from the developmental impact to earlier results in the results chain. This might lead to losing track of the impact, which compromises the ultimate goals (*Bohte & Meier, 2000; Warner & Havens, 1968*). These changes will be discussed in this research paper.

3. Methodology

In this research, the aim is to answer the two research questions presented in the introduction. These questions have been approached through a systematic, multi-disciplinary methodology. This means different methods will be used in the research. When conducting mixed-methods research, different methods are used to examine the same phenomenon. Triangulation across the different methods makes it possible to identify different aspects of a phenomenon with greater precision than using one method by approaching it from multiple points of view. Furthermore, each method has different strengths and weaknesses, and when used in the right way, the weaknesses of one method can be compensated for by the use of the other method, which does not have the same weaknesses (Halcomb & Hickman, 2015; research & 2009, 2009).

This report will look into the main methods used in this research, which are literature review and interviews for the data collection. Furthermore, a coding analysis is used for the processing of the data. This mixed research approach is used to validate results obtained with different methods, elaborate and clarify findings of different methods, and analyse research from different angles. This provides a more comprehensive and complete understanding of the research problem and a detailed and holistic view of the studied considerations. Furthermore, it focuses more on developing the analytical framework because it helps explain findings and causal processes.

The first method used is a literature review. A literature study provides insight into the current knowledge, theories, methods and gaps in existing research. This way, it establishes an understanding of current research in a specific field of research before carrying out new investigations (Atkins et al., n.d.; Machi & McEvoy, 2021). This understanding will help form an overview of the considerations and retrieve information on these considerations in this research. Therefore, a literature review will form the starting point of the research. The main aim of the literature review will be twofold. Firstly, the literature review will help establish an overview of the current knowledge available in the field of RBF in the energy access sector. On the other hand, conducting a literature review will help identify research gaps. These can be used to set the interview agenda (see 3.2. Interviews). In such a manner, it complements the interviews in which new information is retrieved (Lai, 2011).

The following part of the methodology includes conducting interviews. In this case, interviews are an attractive method of data collection. This data was helpful to retrieve additional information from the existing literature, get more in-depth information and fill research gaps (Kendall, 2008). Also, it complements the literature review. The literature review helped to identify research gaps that can be focused on during the interviews. Because limited information is available in the area of interest, this method helped to enrich the research field. Furthermore, different experts and stakeholders could be interviewed, which helps to view the research questions from different perspectives and make it possible to compare information between interviewees (Alshenqeeti, 2014).

Then the process of developing the analytical framework resulting from the literature review and its coding process is presented. Understanding parts of the analytical framework will help understand some essential parts of the coding analysis. Therefore, it is presented beforehand.

While the literature review and interviews were methods of data collection, the data also needed to be processed. Therefore, the literature review and interviews were supported by a qualitative coding analysis based on the method of Creswell (2014). A code is the assignment of category or attribute to a word, (part of a) phrase or multiple phrases (Saldana, 2009). The goal of coding is to manage, filter and categorize the data. With coding, this report aims at a specific goal of coding; to get an inclusive overview of the data. The aim is to limit the researcher's view to avoid biases, systematically identify the considerations and include different elements of information (Saldana, 2009). This helped to

answer both research questions. Firstly, the coding process consisted of an interactive process with the analytical framework. This helped to construct the framework and to answer research question 1. And secondly, together with the framework, it helped get a clear view of what each consideration entails. This helped answering research question 2.

In this research, the literature review was executed first, including the coding process. Afterwards, the interviews were executed and coded. In this way, the interviews could build on the literature review. Furthermore, these methods complemented each other. All methods are explained more in-depth below. First, the literature review will be explained, then the interviews, then the process of developing the analytical framework and lastly, the coding process. These could not always be presented in chronological order. To understand the chronological sequence in time of the methods used, see *Figure 3.1*. Here each subsection is shown when it was used.

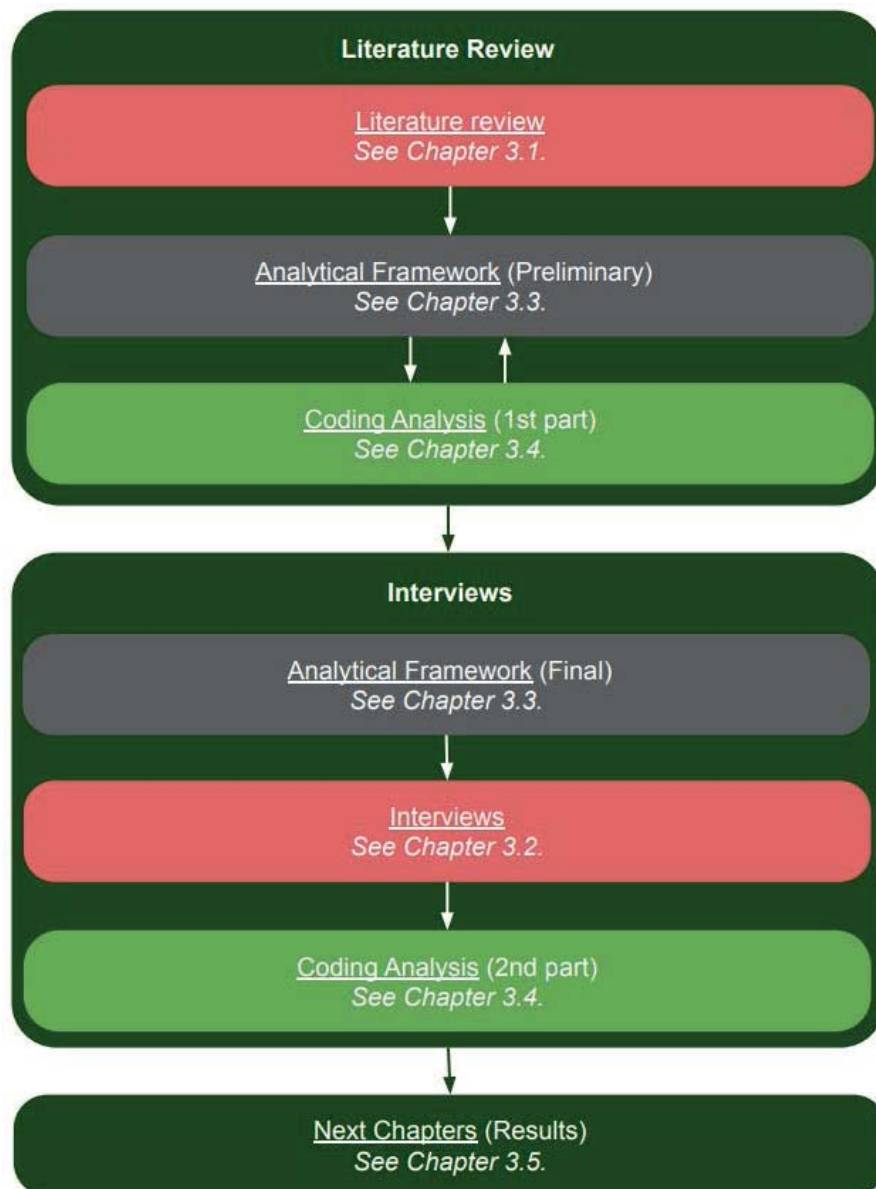


Figure 3.1. Chronological order of the methods and analyses used⁷.

⁷ An important note is that the coding analysis and the analytical framework interacted with each other, which is shown with the arrows in two directions.

3.1. Literature Review

Before diving into the literature review used in this research paper, the general guidelines for a literature review are explained. The basics of a literature review consist of different steps. First, in step 1, the relevant information needs to be determined. Relevant information is the information a researcher would like to retrieve from the literature sources. In this way, the relevant information forms the boundaries for the search criteria of a search process. Secondly, in step 2, this determination of relevant information is used to search for sources that fit the criteria. Only sources that fit the criteria are selected. Lastly, the selected sources are used in the next part to process the data and write the literature review. These steps are shown in Figure 3.2. (Machi & McEvoy, 2021; Williams, 2018).

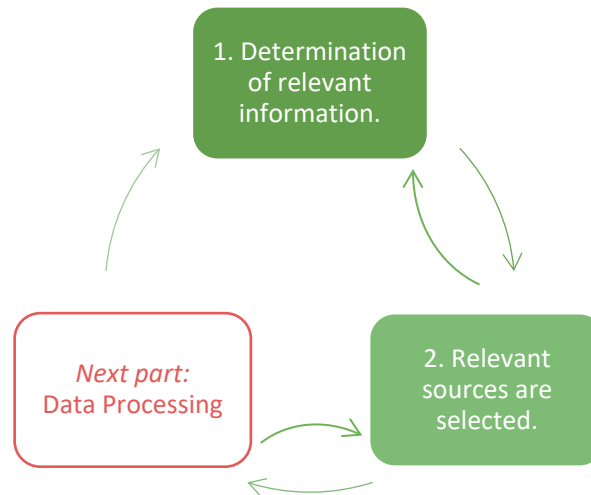


Figure 3.2. Steps in the literature review (based on (Machi & McEvoy, 2021; Williams, 2018)).

Although the explained process might seem linear, this is not the case. Feedback loops are part of the process (Reed, 1998). For example, when during step 2 turns out that no or only limited sources can be selected within the search criteria, it might be the case that the boundaries of the search criteria of step 1 need to be broadened or defined differently. Or, when in step 3 occurs that the selected literature is not fit for answering the research question, step 2 might need to be repeated or even step 1 needs to change slightly. These steps are taken until enough information is retrieved to complete the research. In this way, the process of a literature review can be iterative. However, this is not always possible. If it is impossible to increase the research field or no other sources can be found, a research gap is found. This means additional research is needed .

The literature review undertaken for this research followed the above steps. The process to retrieve suitable sources was not without challenges. Iterations and changes had to be made to retrieve a limited but acceptable number of sources. This process is described below.

Step 1: Determination of Relevant Information

The first step of the literature review determined what would be the relevant literature. In this report, the basis of relevant literature were sources that provide relevant information about RBF programs in the energy sector. This was the focus of the sources, and this formed the boundaries. This resulted in two clear primary criteria: first, results-based financing should play a central role in the selected literature sources, and second, the energy sector should be considered for each source. Also, there were some secondary criteria. The papers must involve the technologies of solar home systems and/or

clean cooking stoves. Moreover, it should be about the Global South. And, it must somehow be relevant for developing an RBF program.

Also, the kind of sources needed to be determined. There is academic literature and grey literature. The academic literature is written by scientists or experts in the field. These are published in peer-reviewed scholarly journals. Grey literature are sources that are not created through traditional academic publishing channels. Typically these are sources like reports, working papers, government documents and evaluations (Mahood & Eerd, 2014). In most cases, academic sources are considered to have the highest standard for scientific research and provide a level of authority and credibility, which enhances the overall quality of research. Therefore, in the first instance, academic sources were focused on.

Step 2: Selection of Relevant Information

Once the criteria for relevant information were determined, the relevant sources could be identified and selected. Multiple databases for academic sources were used like Google Scholar, Scopus and ScienceDirect to select suitable academic papers. The primary criteria were most important to find papers adhering to the criteria. Therefore, multiple combinations of keywords were used. The keyword that always needed to be somehow involved was "Results-based financing". This term itself was used or synonyms for RBF, like the ones mentioned in *Chapter 1.2. Results-based Financing*. Also, words like "subsidy", "financial tools", or "financial instruments" were tried in combinations with words like "output" or "results" to ensure all relevant papers could be found. Secondly, because the focus is on the energy sector, keywords that needed to be involved were words related to "energy", like "off-grid", "electricity", "solar home system", or "clean cooking". For a complete list of keywords, see Appendix A. Another restriction was that the academic papers had to be dated in or after 2010 to keep the information relevant and because RBF in the energy sector took off from that year on. This did result in a batch of results in the different databases for each attempt. For example, when the keywords "results-based financing" and "energy" were used, this resulted in 79 results on Google Scholar, 62 results on ScienceDirect and four results on Scopus. While many articles did overlap in the different search attempts, there seemed to be enough literature to be used for the selection process.

Next, the relevant literature identified in this manner needed to be selected out of all these results. These were selected based on the primary and secondary criteria. A large number of sources was excluded because after scanning the abstracts and when possibly relevant also the introductions, subtitles and conclusions of the literature sources, many sources were found not to adhere to the primary criteria. Also, a group of literature sources was excluded because the research was not applicable to aid in developing countries or did not include the right technologies. Another group seemed to be relevant in the first instance, but after reading further, it appeared to be irrelevant for developing an RBF program. In the end, only two academic papers did adhere to all the criteria, while all others had to be rejected. As mentioned in Stritzke et al. (2021), it seemed true that there was minimal academic literature available on the subject.

To increase the dataset, also another method was used: snowballing. Snowballing is a method of non-probability sampling, which means that a primary data source is used to connect to other data sources (Badampudi et al., 2015; Wohlin, 2014). In this case, the two available academic literature sources were used to retrieve new academic literature sources. However, this also led to sources that did not adhere to the criteria. Furthermore, experts were approached for relevant literature. Nevertheless, also this led to a dead end. Therefore, the initial academic dataset remained at a low number of two academic literature sources.

Feedback Loop

Because the dataset remained to be very small, step 1 was reconsidered. The content of the sources and, subsequently, the search criteria were hard to change because this was the actual information that was needed to answer the research question. However, what could be changed is the kind of sources searched for and, subsequently, the used databases. Therefore, the choice was made to consider not only academic literature but also grey literature. Grey literature is usually not peer-reviewed and does not need to adhere to the standards of academic literature. On the other hand, the advantage is that it brings a lot more data to the dataset. This way might bring a more balanced picture of the available evidence than two academic sources (Pappas & Williams, 2011). However, it also brings more responsibility for the researcher to select reliable sources. In this case, it was essential to consider the author with his/her qualifications, the publication source, check reference lists, look into the data collection and its transparency and check data if possible (Mahood & Eerd, 2014). For example, a paper published by the World Bank is generally of a certain standard, but if it is a small NGO that cannot be verified, the source could be rejected.

So, the literature search was extended to non-academic sources or grey literature. Firstly, a new database was used, which was Google. In this case, for the same keywords as used above, “results-based financing” and “energy”, in total 539 results came up. Together with all the other keywords, this led to a considerable amount of data sources. Again, these were filtered with the primary and secondary criteria, and the reliability was checked. This time, the process appeared to be more effective and resulted in a few new sources for the dataset. Furthermore, snowballing was used once more on the two academic literature sources and the newly retrieved grey literature sources. Now, the snowballing was successful and presented some new sources that appeared to be useful. Moreover, in the experts' references, some valuable sources came forward, which had been perceived as out of bounds the first time. This all resulted in a total of 13 academic and grey literature sources.

Furthermore, the database of RVO appeared to be a great resource as well. Because this contained all internal data, it could not be used publicly. However, this data still appeared to be helpful to analyse. Therefore, in an anonymized form, these sources could be used. These sources account for the 14th source of the analysis. Therefore, 14 sources were found and used for the literature review, which can be found in Table 3.1.

Table 3.1. Literature sources used for the literature review.

	Title	Keywords	Literature	Organisation/Journal	Year
1	Results-Based Financing (RBF) for Modern Energy Cooking Solutions: An Effective Driver for Innovation and Scale? (Stritzke et al., 2021)	Results-based financing; clean cooking; modern energy cooking services; private sector development; energy access	Academic Paper	Energies (<i>Journal</i>)	2021
2	Innovative Financing for Humanitarian Energy Interventions (Cohen & Patel, 2019)	Energy access; refugees; financial instruments; humanitarian aid; SDG7	Research Paper	Energy 4 Impact; Chatham House; Practical Action; Norwegian Refugee Council (NRC); Office of the United Nations High Commissioner for Refugees (UNHCR)	2019
3	TIME to Change: An Evaluation of Practical Action Nepal's Results Based Finance Program (Robinson et al., 2021)	Nepal; results based financing; improved cookstove; modern energy services; SDGs; energizing development;	Academic Paper	Energies (<i>Journal</i>)	2021

4	Results-Based Financing Approaches; Observations for Pay for Success from International Experiences (M. Eldridge & TeKolste, 2016)	Pay for success initiative; results-based financing; developing countries;	Information Briefing	Urban Institute	2016
5	Effective Results-based Financing Strategies (GPOBA, 2018)	Output-based aid; results-based financing; development financing	Research Paper	Global Partnership for Results-Based Approaches (GPOBA), World Bank	2012
6	Results-Based Financing for Off-grid Energy Access in India (Jha & Jain, 2012)	India; results-based financing; energy-access; off-grid energy	Working Paper	Council on Energy, Environment and Water India (CEEW)	2012
7	Review of major Results Based Aid (RBA) and Results Based Financing (RBF) schemes (Pearson et al., 2010)	Results-based aid; results-based financing; results;	Research Paper	Human Development Research Centre (HDRC), Department for International Development (DFID); UKaid	2010
8	Stoking finance for affordable cookstoves: Experience from Malawi and Zimbabwe (Johnstone, 2020)	Clean-cooking; Malawi; Zimbabwe; affordability gap; financing instruments	Information Briefing	International Institute for Environment and Development (IIED)	2020
9	Hitting the target? Evaluating the effectiveness of results-based approaches to aid (Pereira & Villota, 2012)	Results-based financing approaches; development gap; assessment	Research Paper	European network on debt and development (Eurodad)	2012
10	Results-Based Financing in the Energy Sector (Vivid Economics, 2013)	Results-based financing; energy; instruments	Technical Report	Vivid Economics; World Bank	2013
11	Results-based Financing for Energy Access (Weber et al., 2018)	Results-based financing; energy access; development aid	Evaluation Report	Energising Development (EnDev)	2018
12	Incentivizing A Sustainable Clean Cooking Market (World Bank Group, 2018)	Indonesia; results-based financing; clean cooking	Evaluation Report	World Bank; ASTAE; Australian Aid	2018
13	Results-Based Financing to Promote Clean Stoves: Initial Lessons from Pilots in China and Indonesia (Zhang & Adams, 2015)	Results-based financing; clean cooking stoves; China; Indonesia;	Information Briefing	World Bank	2015
14	<i>Internal Evaluation Reports</i>	Results-based financing; SDG7; energy access; clean cooking	Evaluation Report	Netherlands Enterprise Agency (RVO)	2020-2022

Next Part: Data Processing

Next the data can be processed. Coding was used in order to process the information from the selected sources. This coding process is explained in *Chapter 3.4. Coding Analysis*.

3.2. Interviews

The following data collection method used is interviews. Also, for the interviews, several general steps were followed. In step 1, the specific aims are determined that the interviews should satisfy. The objectives could be, for example, the need to fill a research gap or the need for confirmation on a particular topic. In step 2, these objectives are used to determine which interviewees seem to be relevant. The interviewees need to seem fit to help to reach the objectives, e.g. because they seem to be fit to have relevant information on a research gap. Only interviewees who might help to reach the objectives are selected. Thirdly, the interviews are prepared and executed. This preparation is vital to

be able to reach the objectives. Then, in the next part, the information from these interviews needs to be processed (McNamara, 2022; Sussman et al., 2021). These steps are shown in *Figure 3.3*.



Figure 3.3. Steps of the interviews (based on (McNamara, 2022; Sussman et al., 2021)).

The process of realization of these steps for this research paper is described below.

Step 1: Determination of Research Aim

For this research, the main research aim is already indicated in the research questions, which is to increase knowledge of the considerations for the development of an RBF program in the energy sector. During the literature some more specific aims were identified, e.g. filling research gaps identified in the literature review, cross-validation of the available information of the literature review or obtaining a diverse range of perspectives on the topic because this allows for a more inclusive research result.

Once the interview aims were known, a suitable structure for the interviews needed to be identified. The degree of structuring can be divided into three categories: structured interviews⁸, unstructured interviews⁹ and semi-structured interviews. In this research paper is chosen for the latter: semi-structured interviews. Semi-structured interviews are a mix of both structures mentioned before. In a semi-structured interview, questions are prepared in advance. However, semi-structured interviews also offer the flexibility and possibility to ask additional follow-up questions based on the respondent's answers and go more in-depth (Fylan, 2005). In this way, it allows more in-depth research than structured interviews because it is allowed to probe and expand the interviewee's response. However, it also allows more structure than unstructured interviews to target particular objectives, like filling research gaps, because questions are prepared in advance, which gives already a particular direction for acquiring information for the interview (Alshenqeeti, 2014). In this research, the interviews will especially target specific aims like the research gaps by preparing questions in advance. However, it is not always known what this research gap entails. Therefore, the researcher might not be able to prepare all questions needed in advance because it is not always possible to hypothesise on the needed information. This makes it desirable to have the possibility of asking follow-up questions. These characteristics make a semi-structured interview format the best option for this research.

Step 2: Selection of Relevant Interviewees

Secondly, the interviewees needed to be selected. Because of the broad scope, it is impossible that one interviewee would have all the answers, so multiple interviews were necessary, involving different

⁸ A structured interview uses a predetermined set of questions, which are prepared in advance. The fixed-format allows embedding the predetermined objectives in the interview. Also, the sequence of these questions is always the same for each interview. This standardization minimizes the effects of the interviewer and the instrument on the interviewee and maximizes the systemic acquiring of information. This results in a more quantitative way of data collection (Alshenqeeti, 2014).

⁹ The opposite of a structured interview is an unstructured interview. Here questions are not prepared in advance, but questions are composed during the interview. In this way, if interesting topics come up, an interviewer has the flexibility and freedom to ask every question that seems interesting. This allows for more in-depth information, and it also helps to start the interview without a priori categorization, which might limit the information gathered (Wildemuth, 2016). This results in more qualitative research, which allows for exploration (Kendall, 2008).

interviewees. Moreover, different interviewees have different views, biases and perspectives. By interviewing multiple experts, these biases are reduced, the data is deepened, and the results are perceived as more inclusive and reliable (Alshenqeeti, 2014; Kendall, 2008).

The interviewees were selected based on the objectives set. All interviewees together should be able to fill in the identified research gaps and provide additional information, in-depth knowledge and confirmation if necessary. Therefore, interviewees were selected based on their assumed knowledge. The similarity between the interviewees is that they all need to be acquainted with an RBF program in the energy sector. However, also differences were necessary. As mentioned before, the aim was to gain different perspectives on the development of RBF programs. Therefore, experts were selected from multiple organisations which fulfil different stakeholder roles and are part of different RBF programs in the energy sector.

In this case, the principal is the main stakeholder concerned with developing an RBF program. Therefore, the primary focus will be on principals with experience in the energy sector because these actors are assumed to hold the most knowledge on the topic. A certain level of overlap in interviewees was aimed for because this allowed to compare the answers and the view on a specific program, but at the same time, diversity was essential to get a more inclusive picture of the sector. To get principals from different programs and organisations, first, an overview was constructed of all the RBF programs in the energy sector (see Appendix B). Based on this overview, experts working on different programs and in different roles were selected and approached. This led to a diverse initial sample of interviews with principals. Then, by using snowballing, this set of interviewees was asked for contacts with other interesting experts in the same program and outside the program. In the end, this resulted in an adequate number of 10 principals who fulfilled that role in at least 12 different programs.

Additionally, agents' experiences are essential because these are experiencing the programs from the other side of the table. Therefore, the aim was to interview multiple agents as well. However, it was harder to approach agents. Agents are, to a certain extent, dependent on principals, so this group might be more hesitant for being part of an interview about the RBF program they are participating in. Therefore, the network of RVO appeared to be crucial and allowed for interviewing agents participating in their RBF program of SDG7 Results. The sample of these agents was randomly picked. Interviewing agents participating in the same program allows for comparing the answers. However, also two other agents were found who were willing to share their experiences. This resulted in six interviewees who participated in an RBF program in the role of agent.

Furthermore, some experts were interviewed who have or had another role. An important one is an independent verifier. One crucial information gap was identified at the level of the verification process in RBF. The principals could partly fill this gap, but the information from someone in the verifier role helped address the research gap. Secondly, some interviewees were employed in umbrella organisations in the field of energy development. These organisations do not participate in or develop RBF programs themselves but oversee the sector and, therefore, might hold a more independent view.

Altogether, this resulted in a total of 17 interviews. The interviewees will not be mentioned by name to protect their privacy, but their characteristics can be found in Table 3.2.

Table 3.2. Characteristics of the interviewees.

	Organisation(s)	Stakeholder Role	Program(s)
A	KOKO	Agent	SDG7 Results
B	Energy 4 Impact; -	Umbrella Organisation Agent	-; -

C	Clean Cooking Alliance	Umbrella organisation	-
D	World Bank; GOGLA	Donor, Principal; Principal	GPBRA, *; GOGLA
E	ATEC	Agent	SDG7 Results
F	GIZ	Principal	EnDev
G	KPMG	Verification Agent	SDG7 Results
H	RVO	Principal	SDG7 Results, EnDev
I	ManSEA; SNV	Umbrella Organisation; Principal,	-; TICS, *
J	Nordic Environmental Finance Corporation	Principal	BGFA, BGFZ
K	C-Quest Capital; SNV	Agent; Principal	BIX RBF program; VBP
L	Bamboo Capital Partners; GIZ	Principal; Principal	OMDF; EnDev
M	SNV	Principal	VBP
N	AECF; ACE TAF Energy 4 Impact	Principal; Principal; Umbrella Organisation	REACT; ACE TAF; -
O	SNV	Principal	BRILHO, EnDev, TICS, *
P	ACE	Agent	SDG7 Results
Q	Vitalite	Agent	SDG7 Results

* Involved in multiple (other) RBF programs within the organization.

Step 3: Interview Execution

An interview guide was prepared in advance for the execution of the interviews. Although a semi-structured interview allows for flexible questions, it remains crucial to prepare the main questions and structure these. This helps in retrieving targeted information that will answer the research question (Miles & Gilbert, 2005). Two different general interview guides were developed. One interview guide was developed for the principals and the umbrella organisations. These entities know more about the development side and why certain decisions are made. Also, these have a better overview of other developments in the sector and the share of RBF. Another interview guide was developed for the agents. The agents do not always have a good view of why certain decisions are made but do experience the effects of these decisions. This is a factor that is not experienced by the other stakeholders. Therefore, both needed different questions to retrieve information.

To prepare the interview guides, different steps were followed (Fylan, 2005; Miles & Gilbert, 2005). Firstly, as mentioned before, the literature review was executed, which resulted in different themes and specific research gaps. These identified research gaps, missing perspectives and information for confirmation were the first indication for interview questions. Then, all questions that needed to be asked to retrieve new data input were written down. These were mainly open questions. At this point, the questions were categorized into different sub-sections to structure the interview in the interview guide. These sub-sections were based on thematizing the questions and an indication of the analytical framework (see Chapter 3.3.). This resulted in the sub-sections: introduction, importance and strategy of RBF and optimal design of RBF. Finally, these interview guides and their questions were peer-

reviewed by some employees at RVO and the first supervisor. This resulted in the final version of the two interview guides. These can be found in Appendix C.

While general interview guides were prepared, for every interview a background study was also done on the interviewee. This resulted in openings for interesting additional questions, questions that could be more specifically targeted to the interviewee, or the erasing of irrelevant questions. Although the main structure stayed the same, the questions within could be adapted to specify the knowledge of an interviewee to reach the objectives of the interviews.

Next Part: Data Processing

In the end, the information from the interviews was processed through transcription followed by coding. This process is explained in the next *Chapter 3.4. Coding Analysis*. The coding of the literature sources which preceded the interview data processing is also explained in this section.

3.3. Analytical Framework

In this third sub-section, the process of the analytical framework is explained. This is done previous to the explanation of the coding process because the developments of the analytical framework were important to the coding analyses of the literature review and the interview. In this way, the coding section can refer back to the development of the analytical framework (see *chapter 3.4. Coding Analysis*)¹⁰.

First, the concept of an analytical framework will be explained. An analytical framework is a representation of the key subjects to be studied in a graphically or narrative form (Maxwell, 2005). It provides a comprehensive understanding of a phenomenon (Jabareen, 2009) by structuring the concepts, assumptions and theories in the area of interest (Miles & Huberman, 1994). In this way, an analytical framework provides a clear focus on the key concepts to be studied by helping to understand, restructure and analyze these (van der Walddt, 2020). Also, it is a good way to communicate clearly to others the many concepts used when presented in a graphical form (Lee & Kim, 2018). In this case, the analytical framework needs to represent the primary considerations when developing an RBF program.

The analytical framework was crucial to the research because the analytical framework was used to answer the first research question. The final analytical framework was developed during an iterative process of deliberation after finishing the literature review and an interactive process with its coding analysis (see *Chapters 3.1. and 3.4.*). This resulted in different concepts, which were peer-reviewed by employees at RVO and the first supervisor. This process resulted again in a final framework. The final framework is presented in Chapter 4. However, the process of development, including the different concepts, is described below.

Concept 1

In the beginning, the research question had a different focus. Instead of focusing on the development of RBF, the focus was on the design phase and on which considerations were essential to this design phase and not on the identification of the program (see *2.2. Program Cycle for RBF*). Therefore, the focus was on aspects such as time, finance and verification. The first analytical frameworks were

¹⁰ However, referring forward could not be completely be avoided because to a certain extent the same applies vice versa. The process of which considerations were considered for the framework is closely connected to the development of the analytical framework as well and cannot be considered completely separately since the coding process gave input to the analytical framework as well. Therefore, occasionally still need to be referred forward to the next chapter.

developed to map these design aspects of RBF and dive into specifically these considerations. This resulted in the first concept for the analytical framework.

Concept 2

However, the research focus was altered during the research due to two main reasons. Firstly, in the beginning, considerations specific to the design phase were focused on. However, after starting the coding of the literature review, many other considerations for an RBF program came forward as well. These did not fit into the design phase, but these considerations were still essential to the design phase and RBF development. These were mainly considerations in the stages before designing a program. Due to the constant return of multiple of these considerations and the importance of these considerations for designing an RBF program, these received more and more attention. A second reason for including other stages was that while the central question of RVO in the beginning seemed to be to research what considerations are essential for the design of an RBF program, during the process, also other questions from their side came forward focusing on the pre-stages. Questions arose like when RBF is desirable, when RBF is additional and how negative market distortions can be prevented. These questions needed consideration in the stages before designing an RBF program, and therefore, these questions showed the interest in these pre-stages as well.

So, there was decided to broaden the focus of the research from the design of RBF to the development of RBF. This resulted in a new broader scoped framework for analysis. Furthermore, it resulted in a range of old and new considerations. The new diversity in considerations was the first substantial change to the analysis framework and resulted in a second concept version of the framework.

Concept 3

Then some alterations to this second concept version were done based on applying the framework to the literature of the literature review. During this process, some considerations were removed because they seemed redundant, some were added because they seemed essential, and some were slightly altered to pinpoint the consideration better¹¹. This resulted in a preliminary concept. Next, this framework concept was reviewed in a focus group session with experts in the field of RBF in the energy sector of RVO (*see Appendix D for the slides and notes of this session*). A focus group is a form of group interview in which a small number of people are participating. It is a convenient way to collect data from multiple people simultaneously. Also, the interactions and deliberation between participants can help retrieve a better image of the session's focus (Morgan, 1996). In this research, eight people participated in the focus group. The goal of this session was to get input into the considerations for the framework to make sure it was inclusive and focused at the same time. In the session, some adaptations were made to the considerations. For example, some additional elements came forward that are important to include in the framework, such as the consideration of which level of development a market should have, the additionality of an RBF, and the different stakeholders that should be considered when developing an RBF program. The outcome of this focus group was a third concept version existing out of 14 different considerations.

Concept 4

After some minor changes¹², like renaming a certain consideration, a substantial change occurred after an inductive process of analysing the results of the literature review. Because the stages previous to the design were included as well, the research question did no longer only focus on individual

¹¹ This was the process of applying the framework to the literature review in the 1st coding cycle of the coding analysis (*see Chapter 3.4. Coding Analysis*).

¹² This minor changes are the changes of applying the framework to the literature review in the 2nd coding cycle of the coding analysis (*see Chapter 3.4. Coding Analysis*).

considerations but also on the different development stages in which these individual considerations are most relevant. Therefore, the analysis framework was divided into two sets of considerations: the 'pre-design' considerations and 'design' considerations. However, it soon became apparent that this differentiation could be elaborated further. Firstly, the pre-design considerations were separated again into two different stages: 'desirability' and 'suitability'. One of the considerations which belonged to suitability was the consideration of the stakeholders. This consideration appeared to be very broad and complex. Many different aspects of the consideration came forward, especially because multiple stakeholders have to play a role in, and are concerned with this consideration. The complexity of this consideration showed that it was more than just one consideration. It was a set of considerations on its own. Therefore, secondly, the stakeholders' concerns were divided into separate considerations for each stakeholder, and a new set was constructed. This new set of considerations was named 'feasibility'.

So this resulted in four sets of considerations: desirability, suitability, feasibility and design. The sets of considerations can be considered in sequence. The sequence of sets of considerations can be found in *figure 3.3*. Together with the considerations in a second level under the sets, these formed the fourth concept.

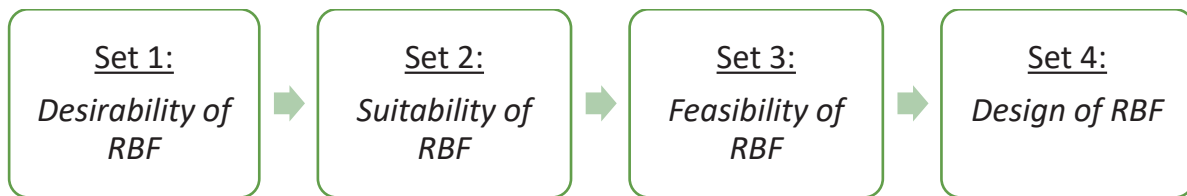


Figure 3.4. Final four sets of considerations of RBF.

Final Concept

Lastly, the sets of considerations each consist of several considerations. These are all on the same level. However, out of the literature review, each consideration which is part of the set about design seemed to consist of multiple aspects. Therefore, these considerations could be divided into sub-considerations. These sub-considerations as part of the analytical framework made the aspects more apparent, and the considerations were better understood. Therefore, the last substantial change was that these aspects were made explicit in the analytical framework. This change added a new level to the framework with sub-considerations. This resulted in the final analytical framework. Also, this concept was peer-reviewed by employees at RVO and the first supervisor. After confirmation from their side, the final framework is presented in Chapter 4.

3.4. Coding Analysis

This last sub-section explains the coding process following the literature research and the interviews. As in the first and second sub-chapters, also in this section, several steps were followed. Previous to the coding analysis, the collected data needs to be presented in the form of text in order to be coded. For example, it is vital to transcribe interviews. Only then the data can be processed. Then, in the first coding step, a codebook needs to be designed. In the codebook, themes are categorized. This results in a list of codes that a researcher uses while coding data (Creswell, 2014). Then, once the codebook is constructed, all sources can be coded. The codes are attributed to the sources, to different parts of the text. The end product of the coding process is all coded parts categorized per category of the codebook. Then in step 2, the coding analysis is presented, and the coding analysis is interpreted (Saldana, 2009). For the steps, see figure 3.4.



Figure 3.5. Steps of Coding (Creswell, 2014; Saldana, 2009).

Previous part: Data Collection

The data collection was described in the previous sub-sections (see Chapter 3.1. Literature Review and Chapter 3.2. Interviews). Here the relevant sources were identified, which could be coded. This was the literature identified in the literature review and the interviews. In order to code the interviews, these first had to be transcribed (for the transcriptions, see Appendix H). Transcription is the process of documenting verbal interview conversations in written text. The process of transcription has to be congruent with the methodological design of the research. In this case, the goal was to deliver a complete and comprehensive transcript fit for coding. Therefore, a verbatim transcription was developed for the interviews, which means that these transcripts are written out but edited for its readability (Dearnley, 2005; Rutakumwa et al., 2020). For these interviews, it was unnecessary to capture every sound, e.g. ums, which were omitted, which makes it more understandable when placed in a code. However, the level of detail is very high. This level of detail was necessary for the coding of the transcripts and the understandability of these codes. Minor detail could make the codes out of its context incomprehensible. When the interviews were transcribed, these were ready for the coding analysis.

Step 1: Codebook Design & Coding

Since the primary goal of the analysis is to get an overview of each consideration, descriptive coding turned out to be the most suitable coding system for the development of the codebook. A descriptive codebook describes in words or short phrases the overarching themes or topics in the data (Saldana, 2009). The codebook does not include all themes or topics discussed in the sources but only the ones that fall within the boundaries of the coding. Therefore, it first needs to be decided what these boundaries are. In this analysis, the boundaries are that each coded part had to be related to a “Consideration for development of RBF programs in the energy sector”. Because this is the central focus of the research paper, coding outside these boundaries would be unnecessary and not be of added value to the research.

When the boundaries were clear, the codes could be developed. In order to come up with a final codebook, first several coding cycles were followed. A codebook is rarely perfect after the first coding cycle. A second, third or even more coding cycle can help filter, highlight and manage the data more usefully (Saldana, 2009). Therefore, multiple coding cycles were used in the analysis (see figure 3.6).

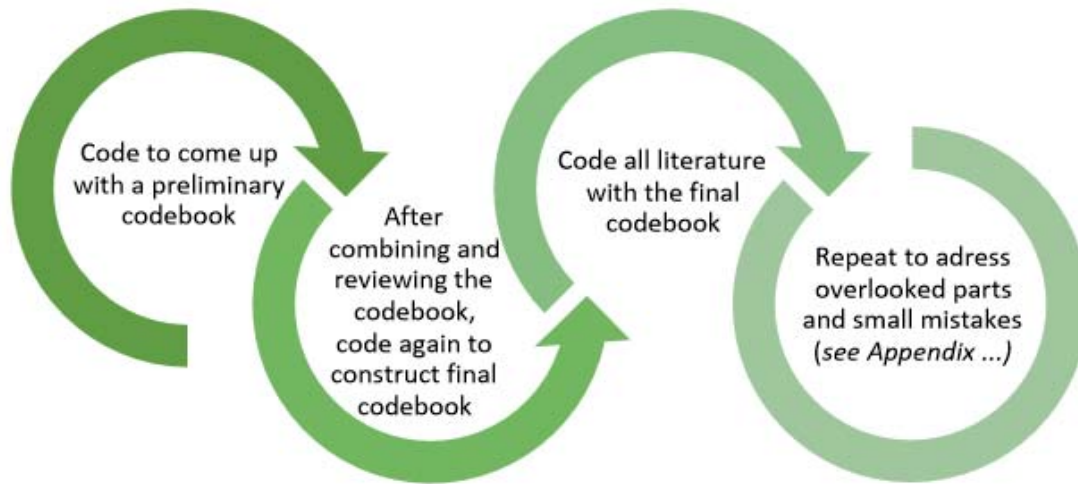


Figure 3.6. Coding cycles used in this report for the coding analysis for the literature review based on (Saldana, 2009).

The first cycle started with input from the analytical framework. As mentioned before, developing an analytical framework and the coding analysis was a process that went hand in hand (for clarification of the interactions, an overview can be found in *Appendix I*). For the first coding cycle, concept 2 of the analytical framework gave input in the direction of what could be coded and how the categorization could be made (See 3.3. *Analytical Framework*). With this input, a first preliminary codebook was developed, which consisted of the boundaries and a level of considerations. Then, this preliminary codebook was used to start coding one of the literature sources. This meant that the text which fell within the boundaries was coded into the different considerations. However, also some changes were made to the considerations and, subsequently, the codebook. Some considerations needed to be renamed, some appeared to be missing, and others appeared to be redundant. This resulted in a new preliminary codebook. To make the codebook applicable to most other sources as well, the process was repeated. The same process was followed from scratch for two other sources, and also here, two preliminary codebooks were the result. Finally, these preliminary codebooks were compared to each other, which resulted in a final preliminary codebook.

The final preliminary codebook was used as input for the focus group session described in the previous chapter (See 3.3. *Analytical Framework*). In the focus group, the considerations important to the development of RBF programs were discussed. This resulted in a new conceptual version of the framework and subsequent changes to the considerations that could be added to the preliminary codebook. Therefore, the input from the focus group was also used to improve the final preliminary codebook to code the literature review. This improved codebook was used for a second coding cycle for a selection of the articles. Some final slight adaptations were made, which evolved into a codebook comprising 14 different codes. This was the final codebook used for the literature review (see figure 3.6.). With the help of the final codebook, all literature sources were coded once. This process was repeated to address overlooked parts and small mistakes in a fourth coding cycle. Now the coding of the literature review was finished.

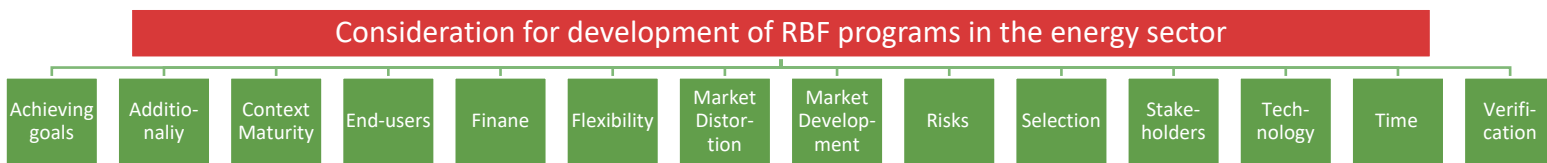


Figure 3.7. Final codebook used for the literature review.

Although the final codebook for the literature review was developed, it was not the final version for coding of the interviews. Because the interviews were coded in a later research stage, the literature review already provided insight for the construction of a suitable final analytical framework for the data analysis (see 3.3. *Analytical Framework*). This final analytical framework altered the codebook again, resulting in a final codebook for the interviews. The basics of the codebook remained the same. However, there were some crucial alterations. Firstly, the final codebook for the literature review consisted of only one level. However, with the emergence of the framework, it became possible to group the considerations into different sets of considerations. Therefore, instead of a long list of individual considerations, a smaller number of coherent sets of considerations now formed the first division level in the codebook for processing the interview transcriptions. The sets are labelled: desirability, suitability, feasibility and design (see Chapter 4 for more information on each set). The second level was similar to the first and only level of the final codebook for the literature review. This level consists of individual considerations. However, there were two differences. First, the consideration of the role of stakeholders appeared to need more focus. The former codebook version included many different stakeholders. In the new codebook, these were split up into six different stakeholder groups: donors, principals, agents, governments, verification agents and manufacturers. Secondly, the level was now grouped under one of the sets of considerations. Furthermore, a third level was added to the set of design considerations. Each design consideration was split up into sub-considerations, only this time, these were set under the old consideration at a new level. This means that for the sets of considerations about desirability, suitability and feasibility, two levels needed to be analyzed in order to give a text a code, and for the design considerations, three levels needed to be considered. The final codebook for the interviews can be found in Appendix G, which is based on the final analytical framework presented in Chapter 4.

The analysis software that was used is NVIVO. This software supports the coding of the articles and structuring of the codes.

Step 2: Presentation & Interpretation

After the coding step, the coding analyses can be presented. Both analyses followed basically the same structure. Only the second codebook was split up into more considerations. Therefore, it was possible to present the results together. This was useful because the analysis of the literature and the interviews could complement each other in this way. While the basic information was used from the literature review, additional information was gathered in the coding schemes of the interviews. The coding results will be presented in chapters 4, 5, 6 and 7, in which each consideration will have its section. Also, the raw data can be found in Appendices E & F. In the end, these results will lead to a conclusion that answers the first research question.

3.5. Next Chapters

The following five chapters present the results of the in-depth literature analysis and the results of interviews with a wide range of experts, both with the help of coding. First, the analytical framework

will be presented in the fourth chapter, and the first research question will be answered. Four sub-questions are developed based on the analytical framework for the second research question. Then, chapters 5, 6, 7 and 8 will be constructed based on these sub-questions. Each chapter will provide the results for answering one of the sub-questions. Finally, in Chapter 8, a conclusion is given on these questions, and then Chapter 9 presents a discussion about the research paper.

4. Analytical framework

An analytical framework is a representation of the key subjects to be studied in a graphically or narrative form (Chataigner, 2017; Gale et al., 2013). It provides a comprehensive understanding of a phenomenon, facilitates sense making and helps logical thinking in a systematic manner (Chataigner, 2017) by structuring the concepts, assumptions and theories in the area of interest (Zhou & Troyanskaya, 2021). In this way, an analytical framework provides a clear focus on the key concepts to be studied by helping to understand, restructure and analyze these. Furthermore, the framework creates a new structure, that helps organize the data so that it can support to answer a research question (Gale et al., 2013; Syme et al., 2015). Also, it is a good way to communicate clearly to others the subjects used when presented in a graphical form (Zhou & Troyanskaya, 2021).

4.1. Final Analytical Framework

In this case, the analytical framework needs to represent the considerations when developing an RBF program. Therefore, the final analytical framework divided the considerations into four sets of considerations, as explained in 3.3. Analytical Framework (see Figure 4.1).



Figure 4.1. Four sets of considerations of RBF.

These sets follow a logical sequence. The sets are ordered chronologically, meaning that only the second set of considerations can be considered and become relevant when the first set is already deliberated upon. In this way, each box in figure 4.1. refers to a different set of considerations that should be the central point of attention at that point. Furthermore, while each consideration examines its own part of the field, only together the overarching theme of the set is addressed. Therefore, each consideration will be important. In total, there are 19 considerations divided among the four sets. As mentioned in the methodology, a particular representation in the final analytical framework is the set of five design considerations. In this set, each consideration consists of a sub-set of sub-considerations. There are, in total, 18 sub-considerations divided among the sub-sets of design considerations. This final framework can be found in Figure 4.2.

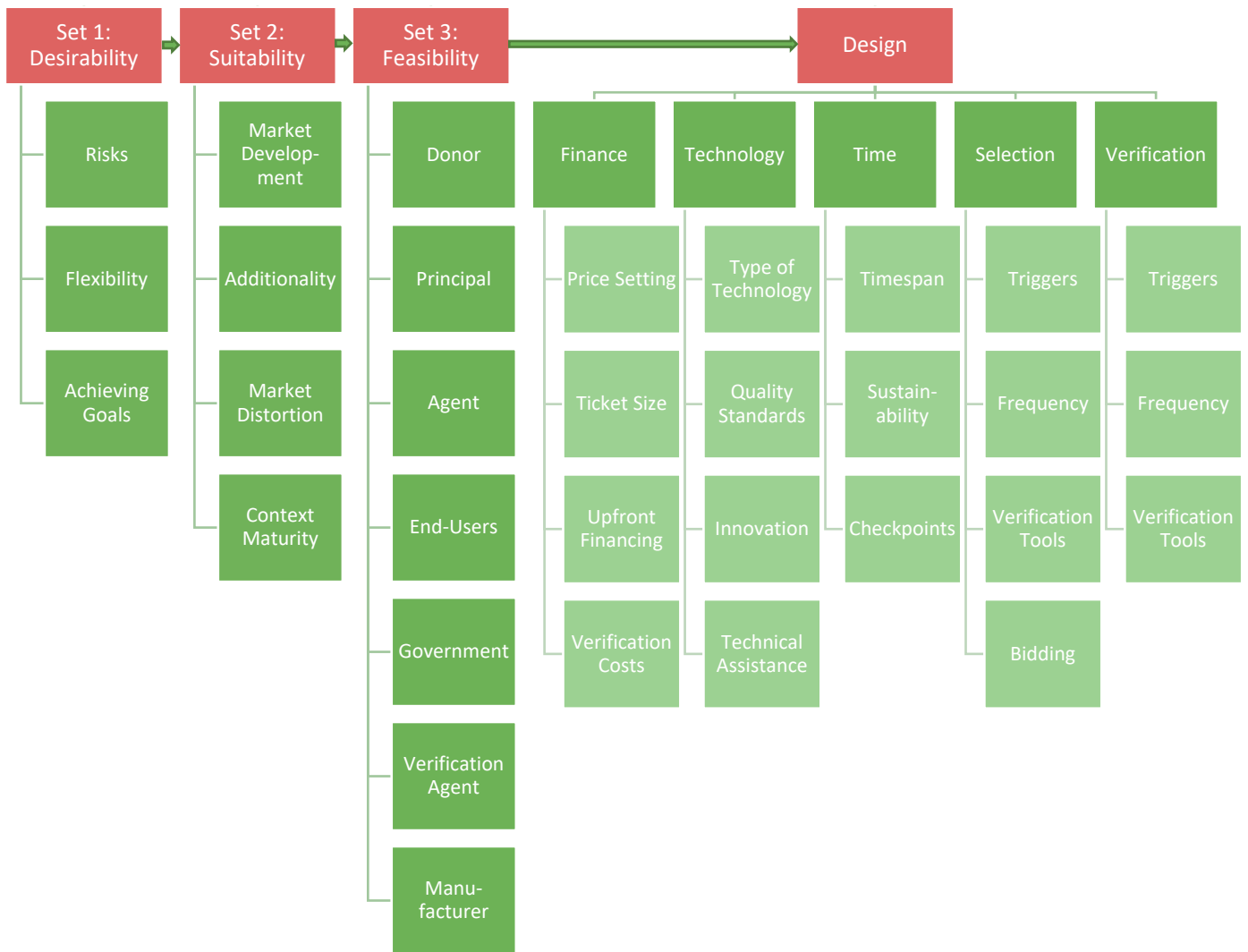


Figure 4.2. Final analytical framework.

4.2. Research Questions

The analytical framework answered the first research question: *What would be a suitable analytical framework for the analysis of considerations for the development of results-based financing (RBF) programs in the energy sector?*

By answering the first research question, the final analytical framework helped:

- chronologically understand the process of development of an RBF program;
- restructure the information of the literature review and the interviews into a structured overview of the main considerations, and;
- provide an outline to zoom in on all the primary considerations of developing such a program.

By doing so, the developed analytical framework will also help to answer the second research question: *What do the considerations for the development of a results-based financing (RBF) program in the energy sector mean?*

The analytical framework can structure the second research question and divide it into sub-questions. This division resulted in four sub-questions based on the sets of considerations mentioned above.

These sub-questions are described below and together the sub-questions will answer the second research question.

The first sub-question in order to answer the second research question researches the desirability of RBF. This is the choice between RBF and traditional financing mechanisms of aid programs. RBF has several advantages but also disadvantages. Therefore, when an organisation considers adopting an RBF program, it is essential to be aware of the advantages and disadvantages to ascertain if RBF fits the organisation's goals and RBF is a desirable instrument to pursue these goals. This leads to the first sub-question:

*(1) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) **desirable**?*

Secondly, the suitability of an RBF mechanism is discussed. If an RBF turns out to be a desirable tool for a principal, the program should also be suitable for the context in which it is implemented. Therefore, it is essential for the organization to consider if RBF is also suitable to implement. This leads to the second sub-question:

*(2) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) **suitable**?*

The third sub-question concentrates on the feasibility of an RBF mechanism. The different stakeholders and their capacities are crucial when considering the feasibility of the RBF mechanism. When the stakeholders and the needed capacities are not present, an RBF program is not feasible. Therefore, the stakeholders and their capacities need to be researched in the third sub-question:

*(3) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) **feasible**?*

And fourthly, when a principal decides an RBF mechanism is deemed desirable, suitable and feasible, the last set of choices concerns how to design the RBF mechanism. Already multiple programs are designed and executed and give information about the possibilities, opportunities, and difficulties of designing an RBF program. This leads to the last sub-question:

*(4) What important considerations need to be decided upon with respect to the **design** of results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS)?*

4.3. Next Chapters

The following four chapters present the results that will help to answer the sub-research questions and, in the end, the second research question. This will be done with the help of the in-depth literature analysis and the results of interviews with a wide range of experts, both with the help of coding. When referring to a specific source this will be indicated with a number or a letter between square brackets. These numbers refer to the literature sources in table 3.1. and the letters refer to the interviewees in table 3.2.

In chapter 5, the first set of considerations is in focus, which is the desirability of RBF. RBF has several advantages but also disadvantages. When an organisation considers setting up an RBF program as a financing mechanism, it is essential to be aware of the advantages and disadvantages to ascertain if RBF fits the organisation's goals and RBF is a desirable instrument to pursue these goals. In this chapter, the considerations discussed are risks, flexibility and achievement of goals.

In Chapter 6, the second set of considerations is discussed, which is the suitability of an RBF mechanism. If indeed an RBF turns out to be a desirable tool for a principal, the program should also be suitable in the context in which it is implemented. Therefore, in this chapter, four different suitability considerations are distinguished. Firstly, the market development phase in which it is implemented is considered. Secondly, the effect of an RBF program should be additional to be valuable. Therefore, additionality is the next factor. Thirdly, market distortion is an important topic because the market should not be negatively distorted, or as little as possible. And lastly, context maturity is considered.

In Chapter 7, the third set of considerations about the feasibility of RBF comes forward. The different stakeholders and their capacities are crucial when considering the feasibility of the RBF mechanism. Therefore, in this chapter, the stakeholders and their capacities are discussed in order to research the feasibility of an RBF mechanism. The stakeholders considered are the donor, principal, agent, end-user, verifier, manufacturer and (host) government.

In Chapter 8, the design component of an RBF program is considered. When a principal decides an RBF mechanism is desirable, suitable and feasible, the last choice is how to design the RBF mechanism. Several design components can be distinguished that turn out to be crucial for a good RBF. The most critical components are the finance of RBF, the energy technologies used, the time component of an RBF mechanism, the selection mechanism within an RBF and the verification process of an RBF program.

5. Desirability of RBF

This is the first chapter that will present results that will help answer the second research question. This chapter will focus specifically on the results for the first sub-question: “*To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) desirable?*”.

All aid programs are said to have advantages and disadvantages. In general, the advantages of aid programs are that aid can, e.g. accelerate the SDGs, increase access to clean energy sources, encourage industrial development, improve infrastructure or create jobs. Disadvantages might be that aid can, e.g. lead to corruption, increase dependency on donor countries, put pressure on the receiving country or exclude smaller organizations. All the advantages and disadvantages strike a balance between whether aid is desirable or not. Nevertheless, desirability goes further. Also, within aid, there are multiple mechanisms, and all these mechanisms have all advantages and disadvantages when comparing them to each other. Therefore, another balance is if an aid mechanism itself is desirable.

This balance of desirability of the mechanism also accounts for results-based financing. When a principal desires to develop an RBF mechanism, the principal considers the desirability of RBF first. Therefore, in this chapter, the desirability of RBF will be researched by comparing RBF to other, more traditional forms of aid. The main difference between RBF compared to traditional forms of aid is the financing structure based on results. While in many aid programs, projects are pre-financed, in RBF, the subsidy is disbursed only when specific pre-determined results are reached. This difference results in several significant consequences. The three most prominent considerations appeared to be the risks of RBF (**4.1. Risks**), the flexibility of RBF (**4.2. Flexibility**) and the achievement of goals in RBF (**4.3. Achievement of Goals**). These will be discussed in-depth in this chapter.

5.1. Risks

Firstly, in RBF, there occurs a shift in the financial risk from the principal to the agent. In traditional financing, many projects were pre-financed, irrespective of their success or failure. This could lead to financial losses owing to projects that do not turn out to be as successful as promised. In RBF, this risk is shifted to the agent. If the project fails and the goals are not achieved, the agents pre-financed the project but do not get the subsidy, which means that the principal does not need to pay for the unreached results.

Advantages

The main advantage of the shift in risk is that it is a risk-minimizing approach for the donors. Only achieved results are subsidised, leading to more subsidies and acceleration in the achievement of the set goals. This is inherent to an RBF because funds are disbursed only for reached results. It makes it an attractive mechanism for donors [4,F]. Moreover, donors pay greater attention to measurable results than in the past. Therefore, they played a significant role in developing RBF mechanisms because these are actually based on measurable results [4]. In this way, RBF attracts more donors and more funds, and an RBF mechanism enhances the accountability of agents to the donors [5].

The shift in risk might not only be positive for the donor but can also benefit the principal. For example, it is a more cost-effective approach because all the funds are spent on results, which is positive for the validity of the activities of the principal [F]. Moreover, the shift in risk may lead to reduced risk on the end-users side because, with an RBF structure, the accountability of the agents might increase. After all, results need to be achieved [4,5,10].

Another decrease in risk on the principal's side is caused by an increase in information on their side. A challenge to traditional forms of aid is the principal-agent problem (see 2.1. *Agent-Principal*

Relationship). RBF reduces the chance of moral hazards because the payments are linked to results. In this way, the agent is dependent on the program's success and, subsequently, the principal's payments. Therefore, RBF solves the principal's problem of having less information than the agent because of how the financing is structured [1].

Furthermore, while compared to traditional financing, RBF might increase the perceived risk for agents, when compared to no financial aid at all, it can still reduce the perceived risks of an activity and incentivise companies to enter new markets and reach new consumers outside the regular scope of operation [1, N]. In this way, RBF can be an alternative structure to finance operations in high-risk regions or displacement settings that are perceived as too high risk for traditional funding [2,N].

Disadvantages

There are also significant downsides to the shift. One of the most significant disadvantages of RBF seems to be the increased risk on the agent's side [N]. The agent's initial financing needs to be funded from other sources, which puts the agent at a higher risk. This is because the subsidy is only provided after reaching the agreed results. This creates a risk of non-disbursement if the results are not met. The risk of non-disbursement while investments have been made is higher than in conventional aid approaches [2,4,5,10]. Furthermore, due to the financial risk being completely shifted to the agents, the poorest companies might not participate in RBF or face an increased risk to go bankrupt. The risk is too high for them [7]. Also, less mature markets in certain countries face more significant problems with (pre-) financing [12,14].

One of the interviewees mentioned: “[the agents] are taking a very big risk, so they have to be very sure that they are going to deliver”. This affects the way agents are going to act [N]. For example, the increased risk might decrease the appetite for innovation and flexible changes because the risk faced by the agent increases [5,N]. Furthermore, placing the additional risk on the agent might require higher subsidies as compensation. In this case, fewer agents can be reached with the same amount of funding. This is a trade-off of RBF [10].

On top of that, RBF might suffer from changes in currency exchange rates between the start of the project and the disbursements. Because in most cases, the principal and the agent are situated in countries using different currencies, especially currency fluctuations or depreciations are a challenge. This makes it also riskier to implement an RBF because there is a time delay between signing the agreement of the RBF and the actual accomplishment of the results and the payment to the agent. In the meanwhile, the exchange rate can change substantially. This might create hesitation among investors to invest in developing countries [1]. This is a significant challenge that needs to be tackled to ensure that the RBF can be implemented.

Furthermore, although the financial risk is more or less reduced with RBF on the donor and principal side, there is still a reputational risk [1]. If the program fails or negatively affects the context, this might damage the donor's reputation. Therefore, a risk on this side is still present, although to a lesser extent. Also, there are several ways to partly overcome the perceived increased risk on the agents' side. Chapter 7 will elaborate further on this matter, but the increased risk on the agent side remains inherent to an RBF mechanism. An example of a way to overcome the risk is implementing milestones or restrictions (*see Chapter 7.4. Selection*). However, at the same time, these might reduce the flexibility of the agent and the appetite to make use of the aid program on the side of the donors.

5.2. Flexibility

This also brings us to the next consideration when implementing an RBF mechanism: flexibility. In most traditional financing, the subsidy is given before the input phase. Therefore, the activities in the activity phase and so various process requirements are predetermined to make sure certain results are reached at the end, that are in line with the program's goals. However, the idea behind RBF projects is that the process of achieving the agreed output is left to the discretion of the agent. In RBF, the funds are only disbursed once these results are actually reached, so principals do not have to worry that they do not spend the subsidy on results that are never reached. This leaves an opportunity for flexibility during the input and activity phases. Therefore, RBF might offer greater flexibility to the recipients to reach the outputs, where traditional funding keeps more control during the process [F,I].

Advantages

This advantage of RBF is essential because most projects encounter unexpected challenges that cannot be foreseen. Principals and agents should have a certain degree of flexibility to react to these changing contexts [1,2,10,12,13]. In traditional financing programmes, the project is planned beforehand, and it is not always easy to change the plans along the way when this requires an agreement by the donor. Agreements must minimise the determination of inputs and activities to ensure flexibility [5]. Forming early views can help focus and determine the RBF strategy, but it is essential to stay open to adjusting these ideas [5]. Therefore, RBF programmes do not focus on planned inputs and activities but on planned results. One of the principals explained, “you are just interested in the outcomes, but not in the how and in the way they achieve something” [F]. Therefore, the principal does not tell the agent how to implement the project but only which goals need to be achieved in order to receive a subsidy. This might result in more flexibility for the inputs and activities to adapt to the changing context during the project, more space to implement own innovative ideas on the agent's side, and a lower need for management on the side of the principal [F I].

So, RBF could demonstrate that funds are properly utilised by attaching payments to results rather than pre-planned inputs. This means the agent is no longer dependent on the contextual conditions pertaining at the start of the project, but the agent can change the input according to changing needs. This allows agents to take responsibility and pursue a variety of approaches and strategies [1,2,5,L]. There are successes of programs that gave the agents the flexibility to adapt their strategies to the context, which contributed to high adoption rates among users and high satisfaction levels [1,5,7,12]. Moreover, because the agents, who are used to the market, probably know best how to tackle specific market barriers, this also leads to a more effective aid approach in many projects [F]. So, providing greater flexibility might maximise results because principals can relax their control, and agents can use the flexibility to learn, innovate and improve their models to the context and pursue more effective strategies [5]. Especially in low-maturity contexts, this can be useful [5].

Disadvantages

In theory, RBF frees agents from implementing predetermined plans and allows them to adapt projects as long as the set goals are reached. In practice, this is not always the case. Principals can still pose limitations and guidelines in the contract on how to execute the project [J,H]. Also, there can be demanding reporting requirements hindering flexibility. This can lead to the agent being held accountable for results and still bearing the risk, although the agent cannot adjust the project [2,5]. There are several forms of limitations to the flexibility in RBFs. One is that intermediate checkpoints might decrease flexibility, but if the checkpoints are re-evaluated every time by the principals, it can enhance flexibility [10]. However, RBF programs might remain vulnerable to changing contexts if restrictive guidelines reduce the flexibility that RBF offers in principle [11].

Another drawback is that while the activities might be more flexible, the agreed output of an RBF program itself might be less flexible. Because outputs are predetermined, it seems more complicated to change them during the process [H], even when circumstances change and changing the outputs would be logical. This makes the output of RBF less easy to redirect. Therefore, it can be important to include in the pre-agreements that changes are still possible [D].

5.3. Achievement of Goals

When creating an aid program, it is essential to set goals. This holds for RBF as much as it does for traditional financing. Whichever mechanism is used in the end is partly dependent on the goals set and if the mechanism can enhance the reaching of these goals [D].

Advantages

Like several other aid instruments, RBF has the ability to enhance access to affordable energy technologies [1]. As stated before, the crucial difference between RBF and traditional financing is that RBF funds are only disbursed when results are achieved. Therefore, RBF focuses more on the results than many other forms of aid. In general, it can be said that RBF increases the focus on output and even outcome in some programs. Receivers are held accountable for achieving the output, which is expected to increase the drive to achieve the output. In this way, the probability that the desired outputs and outcomes are achieved increases. As a result of the increased probability of achieving the output, the desired outcomes and even impact might increase in probability as well because output and outcome are located further in the results chain than input in traditional programs (*see Chapter 2.3.*) [1,4]. Subsequently, RBF increases the chance that resources are spent on successful projects because principals hand out the fund only if the predetermined outputs are achieved. Therefore it tackles inefficiencies, increases cost-effectiveness and makes more efficient use of resources of the beneficiaries (1,0).

This also shows the importance of which goals are chosen in an RBF and where these are placed in the results chain (*see Chapter 2.3.*). The closer the set results are tied to impact, the more flexibility is increased, and prescription is decreased. Some would argue that it is best to tie the results close to the desired impact. Paying for impact aligns attention toward the desired impact [5,10]. On the other hand, this could lead to too ambitious and impractical goals and massive delays in the disbursement of the subsidy [5]. Therefore, there should be a balance between ambitious and practical results [5]. Also, the results that trigger disbursement should be verifiable, and this becomes harder the closer the results are set to the impact. For that reason, it might be better to look at output or outcome, and there are several possible outputs or outcome goals of RBF that might lead to the desired impact. For instance, RBF is an excellent way to scale up initiatives if it matches the market requirements and offers an incentive that balances the needs of the program participants [1,C]. Another frequently used goal of RBF is to incentivise companies to serve market segments outside the usual business scope [2,6,C,J]. Also, it can be used to reach vulnerable groups or customers with different system requirements [6,10] or to develop new knowledge [H]. However, there are also cases when RBF does not seem to be an appropriate mechanism. For example, because RBF mainly focuses on the supply-side, challenges on the demand side are not addressed with an RBF mechanism [L,M]. Also, innovation on the technology side seems to be less present in RBF mechanisms [N]. Therefore, in these situations, an RBF might not be the right fit.

Another advantage is that RBF draws attention to what matters for the principals and makes this clear to the receivers because the goals are predetermined, visible and measurable in RBF. Due to the awareness of the goals, the predetermined output and outcome for disbursement, the mechanism ensures alignment between the principal and the agent (*see Chapter 2.1.*) [5]. Furthermore, in many

cases, however, the aimed input, activities, output and outcomes might be different, the aimed envisioned impact might remain the same as in traditional financing (*see Chapter 2.3.*). A common impact objective for aid programs in the energy sector is to contribute to SDG7 [6]. Therefore, these goals do not need to change.

Also, proving to the stakeholders the effectiveness of the RBF mechanism is much easier compared to other forms of financing. The verification process is already an evaluation in itself. In other mechanisms, evaluation might be oppressed by all other activities. In RBF, because the verification of the results is crucial, data and results are much easier to attain, and the processes make RBF an evaluation in itself. In other aid programs, the data of the results is not always available, making it harder to evaluate the program [5]. The increase in evaluation is an advantage for the donors and principals because they are more aware of what is happening and working, and the effects of their efforts. But also, the increase in evaluation can be positive for the agents and end-users because the program is more likely to be adapted to the circumstances creating effective programs [J].

Disadvantages

One of the main disadvantages of the RBF approach is that, theoretically, it is attractive to focus on paying for impact and subsequently alignment to the impact between principal and stakeholders. However, as mentioned before, practically, there is pressure for immediate results [H]. This is because paying for impact would align incentives, but this is hardly ever possible. Also, it is much less costly and easier to measure output and outcomes more distantly related to the intended impact [3,5,7,10]. Furthermore, the impact is susceptible to external factors, which ultimately limits the agent's control over the impact. This might reduce the agent's incentive to achieve results because the agent might not feel in control [5]. Therefore there is mostly a focus on short-term outputs or outcomes instead of long-term impacts, which are harder to measure. Direct results are needed for the process of verification. However, on the other hand, the focus on immediate output might lead to poor alignment with the intended impact, resulting in incentivising the agent to achieve the results, but not to the intended impact. In this way, focusing on the results might decrease the focus on the actual impact target. Therefore, a project should prevent selecting results that are poorly aligned with goals further in the results chain and focus on indicators that actually record the intended goals (*see Chapter 2.3.*)[5,7,9]

Another drawback might be that the focus on the predetermined goals loses sight of other goals which are desired but not made explicit in the program. So other priorities might be neglected. Furthermore, there is a danger of focusing on less ambitious results because achievability might prevail over ambition. However, a wide range of predetermined objectives might make the RBF mechanism too complex. Therefore a balance is needed [J]. Moreover, in general, there is a lack of thorough research on RBF mechanisms, especially in the energy sector. Existing studies do not always perceive positive and effective results of RBF mechanisms [1,4,7,13]. RBF might even lead to unintended negative consequences, which might be harmful. Unintended consequences might be perverse incentives, distortions, corruption, motivating unintended behaviours, gaming, demoralisation, cherry-picking, dependency on financial incentives, widening the resource gap between rich and poor, and bureaucratisation [4,9]. Of course, not all challenges are unique for an RBF program, but they remain essential to keep in mind.

An important aspect to highlight is goal displacement. In RBF, the focus is mainly on the output and outcomes, and therefore this might distract agents from the impact and lead in this way to goal displacement (*see Chapter 2.3.*). While this could be a threat and disadvantage of RBF, no evidence could be found that indicates that goal displacement is happening in the researched programs. A reason coming out of the interviews with agents, is that it appeared that many companies in this part

of the energy sector are aiming for social objectives rather than narrow commercial self-interest [A,O,Q]. The aim and motivation to reach the developmental impacts as intended by principals seems already to be encompassed in the companies' goals in this sector, and RBF is mainly seen as an additional way of financing their activities striving for those goals (O,Q).

Furthermore, there is almost no evidence that an RBF is cost-effective. It only might be cost-effective if the intended behaviour is worth encouraging [4,7,9]. Also, there exists evidence that suggests program effectiveness is enhanced by financial incentives, at least in the short-run. On the long-run there is no evidence known [1].

5.4. Chapter Conclusion

This section gathered data for the first sub-question: *“To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) desirable?”*. The question was separated into three main factors for the desirability specific to RBF: risk, flexibility and achievement of goals. Starting with the difference in risk of RBF, compared to most other aid mechanisms, there is a shift in risk from the donor and principal to the agent. This can be seen as an advantage for the principal because the risk is minimized. This can also create other positive effects like the possible increase in funds on the donor's side. Also, with a portion of the agent's funding at risk, the accountability of the agents might increase, the principal's problem might be solved, and there might be more alignment on the goals. However, there are also disadvantages, especially on the agent's side, because the risk increases there. That can lead to non-disbursement and bankruptcy, the exclusion of smaller agents, and decreased appetite for innovation.

Furthermore, in theory, RBF has increased flexibility because the input and activity phases are left up to the agent. The advantages of this situation are that the agent can adapt to changing circumstances and implement their own innovative ideas. Also, an agent might make better decisions because an agent is more connected with the market, and an RBF leaves room for an agent's own decisions without the interference of a principal. Furthermore, there is less need for management efforts and control on the principal's side. The main disadvantage of flexibility is that in practice, the idea of flexibility is not always present. Some principals keep a degree of control during the first two phases of the results chain, which results in restrictions on the agent's side. In that case, the flexibility advantages are (partly) undermined.

Lastly, an RBF puts more focus on the results because of the element of disbursement upon results. The advantage of this is that this might increase the probability that pre-determined results are actually reached, that resources are spent on successful projects and that the resources are more efficiently used. Moreover, it draws the attention of all stakeholders to the goals set by the principal, and evaluation is an inherent part of the mechanism. However, there are certain disadvantages, such as the pressure for immediate results, leading to less focus on the impact and the lack of evidence for the advantages.

These are all factors that need careful consideration. The diversity and importance of all advantages and disadvantages make careful consideration necessary. To a certain extent, RBF seems to be desirable, but also, to a certain extent, not. RBF might be a desirable tool to use only when the advantages outweigh the disadvantages. A principal can only make this decision. Only a principal can consider which goals are most important for the principal and if an RBF fits into the path towards these goals.

6. Suitability of RBF

In this chapter, the results that will help to answer the second sub-question will be presented: “*To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) suitable?*”. Suitability can be defined as the fitness to a context. In this chapter, the suitability of RBF regarding CCS and SHS will be discussed because specific considerations appear to be important when looking at a particular context. However, before diving into the suitability of RBF, the discussion if an RBF program can be universal or has to be context-specific needs to be discussed in order to decide upon how to interpret the concept of suitability in this chapter.

In this research paper, the context will be referred to as the circumstances that form the setting of a country or an area within a country because this appeared to be the most common definition of a context among interviewees and literature. Several literature sources and interviewees emphasized the need for tailoring an RBF to the context [1,5,12,C,J,K,L]. One of the interviewees mentioned: “there is no one size fits all” [J]. This group mentions that each country has specific issues, opportunities, policies and circumstances. Therefore, the adaption of the RBF is of great importance to make it suitable. Also, one of the principals tried to make a generic RBF program but “ended up adapting that program into each country” because the generic RBF appeared to be impossible [K]. Even a successful, well-working program could not have the same success in another context. This shows that differences in context significantly affect the program's success [1,K].

Others emphasize a universal approach of RBF that crosses country boundaries is possible [H,O]. One interviewee mentioned it is even necessary to make an RBF as generic as possible to allow agents to be flexible and think for themselves [N].

The level of adaption to the context influences the way suitability is perceived. In more context-specific programs, the suitability of RBF in the context plays a significant role. For these principles, this chapter will indicate the suitability of an RBF mechanism. However, also in other cases, this chapter can give insight into the suitability. In more universal programs, suitability plays a role, although less prominently or differently. So, in either case, if the RBF is adapted to a country's context or not, suitability remains essential.

Therefore, this chapter focuses on the suitability of an RBF mechanism in a context and answers the sub-question stated above. In order to do so, a set of most significant considerations is presented. Firstly, the market should be in a suitable development phase (**5.1. Market Development**). Secondly, the effect of an RBF program should be additional to what is likely to be achieved without the assistance. Otherwise, it does not make sense to implement the RBF (**5.2. Additionality**). Thirdly, the market should not be negatively distorted when implementing an RBF but incentivized by the RBF program (**5.3. Market Distortion**). Lastly, the context needs to have the right maturity (**5.4. Context Maturity**). All these factors together consider the suitability of an RBF program.

6.1. Market Development

The first factor which is considered in the light of the suitability of an RBF mechanism is the stage of market development. There are different stages of market development in which an RBF can be helpful (see *Figure 6.1*). The first stage is the early adopter stage. In this stage, the goal of the RBF might be to push (existing) companies towards the usage of new technologies. However, RBF is generally less used in very innovative projects with high risks on the agent's side. Some interviewees mentioned that it seems essential that technologies and companies have already proven to be effective. If the market is not yet developed, it is not advisable to use RBF as an instrument [F,H]. After all, especially in an innovative project, the risks are much higher, and agents will most likely be less

willing to risk pre-financing [C]. At the same time, the market might not develop, and subsequently, the predetermined targets are not reached. As a result, the project will not receive funds at the end of the RBF contract period. In this way, the higher risks for the beneficiary might limit an RBF program in this stage because an RBF might be less applicable to innovative projects [I,K].

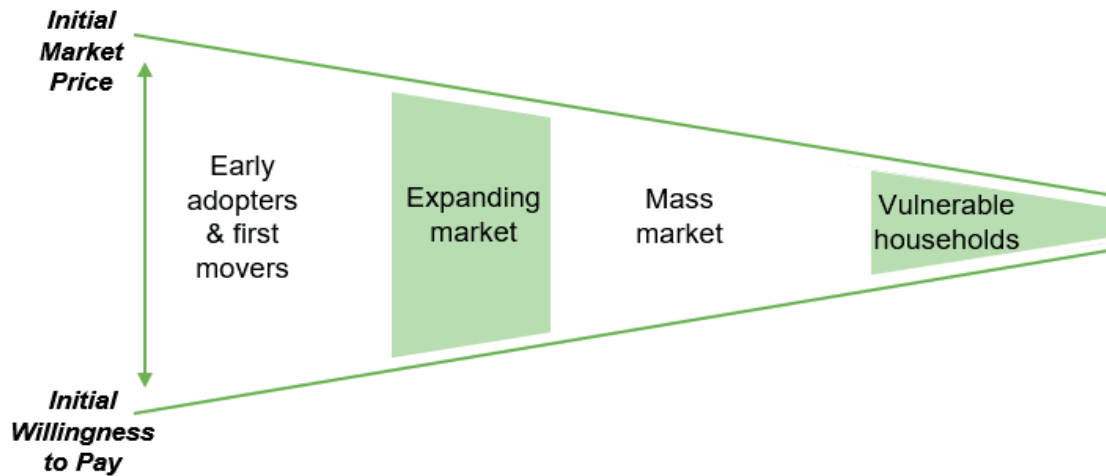


Figure 6.1. Market development stages.

The next phase is the expanding market phase. In this phase, the first barrier of going to the market and introducing the innovation is already passed. However, it is still essential for the innovation to succeed to pass the second barrier: upscaling [H,N]. Here, RBF can play a role to stimulate upscaling and increasing the pace at which the technologies are adopted. Therefore, RBF is an interesting option in areas where the innovation is already introduced but also in areas where the technology itself is new. The principal's goal would be to expand the market of proven technologies [D].

The next phase is the mass-market phase, in which the mass market adopts a technology. There might be less need for an RBF in these developed markets because the mass market is already adopting the technology, and therefore it is more likely that a program will disrupt the market. Still, some programs decide to step into these markets, while other programs avoid these stages for the reasons mentioned above. It depends on the program's goal if this stage is suitable for the principal. For example, when the goal is to encourage the usage of a particular technology and the increase in numbers is most important, an RBF can still be helpful to accelerate this stage [D,J].

Finally, the last stage in which RBF can have a substantial effect is the stage that aims to reach the last group in the market when the mass market is already developed: the vulnerable households. This group might not be able to close the gap between the market price and the willingness to pay themselves. However, RBF can stimulate to close these gaps by, for example, stimulating distributors of a particular innovation to market their products to these groups with decreased prices [D,L,Q].

These different stages can help when researching the market. It is essential to consider the technology's maturity level and the market when considering the suitability of RBF.

6.2. Additionality

The second factor that is important when considering the suitability of an RBF mechanism is the additionality of the mechanism. Additionality determines whether an activity addresses the barriers which prevent the reaching of the particular goal compared to a baseline without the activity [M]. This criterion is valid for any subsidy instrument, including RBF. If the barriers are known in a specific context, a principal can assess the extent to which an RBF addresses the barriers, which might lead to

an outcome in which an RBF is additional to that context [5]. An RBF payment needs to be sufficiently strong to be additional. Otherwise, the incentive is low, and the RBF does not add to reaching the goal [10, M]. Furthermore, if organisations are introducing an RBF, the RBF should enforce new additional activities that might not have been executed without an RBF [14].

There are several cases in which an RBF is additional. In the energy sector, one of the prominent cases, when an RBF is called additional, is when target groups are reached, which could not have been reached without the subsidy [N]. For example, if an RBF addresses the lack of knowledge, opens new markets, reaches vulnerable groups or reaches outside the standard groups targeted by development aid [1,5,10]. An RBF is especially interesting if there is a demand, but the demand cannot be met due to immaturity or other context-related barriers [M].

It is not always easy to demonstrate the additionality [H]. Also, when there is an outcome of the analysis of additionality, it is not necessarily positive. In some cases, the analysis shows that there is little need for RBF because RBF is ineffective in addressing these barriers [5]. For example, in some places, there are already many different aid programs. If up-front grants are offered, these might be more attractive and reduce the need for RBF. Also, even if RBF might be effective in a specific context, other programs might already address the barriers sufficiently, and therefore RBF is not additional [11]. Another reason an RBF might not be additional is that the market is already well developed. Understanding if RBF is additional requires much knowledge about a particular sector and area [1,14]. In the existing literature, doubts are still expressed about additionality because of limited research in the field of RBF and mixed outcomes about the additionality of RBF mechanisms [1,4,7,13].

So, additionality is essential when considering the suitability, because if the RBF mechanism turns out to have no or little additional effect, no other financial aid mechanisms might be more suitable in this context [H].

6.3. Market Distortion

Market distortion is an effect of any intervention that influences the market. In this way, an RBF will always somehow distort the market. As one interviewee mentioned, "we are in the business of market distortion" [D]. However, the goal of subsidies is that these effects should be positive or at least neutral. Unfortunately, this goal cannot always be reached and sometimes, there are more negative externalities than positive ones [D]. Therefore, market distortion is a challenge that should be taken into account when considering the suitability of RBF.

RBF aims for a positive market distortion, like incentivising companies to serve markets outside the usual business scope, attracting new players to the field, stimulating innovation, including technical assistance, raising awareness, or building capacity [2,10,12, E]. Also, there might be positive externalities when introducing a program into a market, like additional knowledge generation [10]. These are all examples of positive distortions.

Nevertheless, also negative distortions can occur. There are several threats that might negatively distort the market. One of the main threats is that the RBF results in uneven competition in the market. Small and medium-sized companies' growth might be constrained because more prominent and larger companies have advantages to get RBF because of economies of scale, higher levels of knowledge, more manpower, etc. This results in unequal opportunities, leading to market disturbance [6, M]. Excluding specific agents can do considerable harm. Interviewee E confirms this. E stated: "I'd be wanting to really be able to open up to anyone in that market, rather than having it to specific companies in that market, because that can create market distortion". Limiting the set of potential

agents may exclude some low-cost and/or high-quality suppliers. Therefore the results are of lower quality or more expensive than necessary [10, E, M].

The problem of exclusion is not unique to RBF. For example, an interviewee who works in an organization helping many small-scale companies mentioned that many aid programs mainly supported larger and western organizations instead of the smaller local companies. Therefore, they were not pleased with most of the subsidies [B]. While it is not unique for RBF, the challenge remains significant. The problem even seems to be more prominent, because of the relatively new mechanism and the strong desire for results. These kinds of distortions need to be kept considered to make the RBF suitable.

Another adverse effect that might occur is leakage. This means that if the retail prices are lowered in a specific region, these lower-priced products might be leaking to other regions. For example, because households are selling their purchased product to the other region. This leads to undesirable market distortion in the other region [D]. Moreover, there seems to be low harmonisation between the different aid programs. This results in competition between different aid programs for applicants and highly subsidised markets, resulting in unbalanced markets [9]. Furthermore, donor-driven aid programs diminish the accountability of the governments to their citizens. Therefore, it might reduce the demand for well-functioning governments by the citizens because donors fill this gap and subsequently such a situation diminishes the role of the governments [9].

So, while the goal is to have a positive effect, (un)expected adverse effects might occur. The positive effects need to outweigh the adverse effects. In practice, the principal never has enough information about the market to know exactly what might happen. However, an expectation of what happens can already help to avoid or mitigate some of the adverse market distortions [10]. Therefore, an assessment of all possible effects is of importance in order to investigate what the alteration is expected to be [H]. A range of instruments is available to avoid or mitigate negative market distortion. Some examples are: mandating certain forms of activities, setting minimum performance and quality standards, taxing activities, providing subsidies and establishing patents [10].

6.4. Context Maturity

The discussion about market development, additionality and market distortion already shows the context's importance when considering the suitability of RBF. This sub-section elaborates on the context and especially on the level of maturity of the context¹³.

When considering the level of maturity, low and high maturity contexts can be differentiated. In both types of contexts, the impact of an RBF mechanism seems to be different. Higher maturity contexts are further developed and already include higher living standards, a more developed economy and a more advanced technological infrastructure, while low maturity is less developed. Therefore, the additionality (of which the importance is explained in the previous sub-section) might be low and implementing an RBF mechanism in a lower maturity context might be more favourable.

On the other hand, low maturity contexts contain higher risks because external barriers are more heavily influenced by these. Compared to high maturity contexts, low maturity contexts face more and higher barriers like poorer consumer awareness, lower (pre-)financing capacities, less favourable policy frameworks and lack of good infrastructure. Also, if the suitable capacity of the players in the field is not in place to support the scale-up of technologies, the RBF mechanism might be ineffective [6,12]. Furthermore, agents in some contexts are less capable of reaching out to the RBF programs,

¹³ The maturity of the context is different from the level of market development. While a context can be already mature, a certain market sector might not yet be developed and the other way around.

and it might be more challenging to reach the target group because of poorer consumer awareness [1,6,14]. Besides, it is good to consider that the costs are generally higher in immature areas. The costs are higher to distribute technologies to marginalised countries due to poor infrastructure, lack of staff, security issues, etc. Therefore, costs quickly erode the profit margins, making RBF less attractive [1]. Moreover, there is a higher chance of businesses encountering humanitarian aid projects that give away technology for (almost) free in these regions, which increases the probability that users wait until such an opportunity comes along [3].

Higher maturity contexts might also face these problems, but generally on a lower scale. For example, a country like Kenya has much more advanced knowledge about renewable energy sources and funding sources, while multiple other countries, like Mali, have considerably less experience. Because of all these limiting conditions in low maturity contexts, it is more favourable to target contexts that are more predictable and where results can be delivered quickly [L].

This conclusion contradicts the conclusion based on the additionality which was that lower maturity contexts might be more preferable. However, there is a balance in the context in which an RBF mechanism seems to be suitable [H]. RBF can be a bridge too far in very low maturity contexts, while in high maturity contexts, an RBF mechanism might not be additional [H,L]. Because responding to different maturity of contexts requires a deep understanding of a local context, a problem-driven approach, and careful tailoring of an RBF, it is not only important to research the additionality as mentioned before, but also the ability of the RBF mechanism to overcome the barriers it is facing. These are very different in every context [F,N]. In this way, a deep context understanding of the barriers helps to assess the suitability [N].

In some cases, a principal may push for their mechanisms in a maturity context that is too low. This leads to the failure of these projects, which shows the importance of considering the suitability [M]. Also, if projects need too much upfront funding, which is hard to fulfil in the area or policies which are not suitable for the RBF mechanism, RBF is not the recommended approach [F].

6.5. Chapter Conclusion

This section aimed to provide the results for the second sub-question: “*To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) suitable?*”. The chapter was divided into four main factors which needed consideration: market development, additionality, market distortion and context maturity.

Firstly, the stage of development in a market is important to consider. While the first stage of early adopters might be less suitable for an RBF, the second stage of expanding the market phase and the last stage of vulnerable households appeared to be much more suitable. Also, at the stage in which the mass market is approached, an RBF can help to accelerate the process but might be less additional. This leads to the second factor: additionality. When an RBF is not additional, this might decrease the suitability of an RBF because the goal of an RBF program is to have an additional effect. To be additional, an RBF program has to be sufficiently solid. Also new or more results need to be enforced. The third sub-section was about market distortion. When an RBF distorts the market mainly negatively, the mechanism might not be suitable. Of course, not in every situation, adverse effects can be avoided, but these need to be limited and not outweigh the positive effects. Only then an RBF can be suitable. Lastly, the context needs a balance in its maturity level. Highly developed contexts might not require an RBF, but very undeveloped contexts might not have the suitable capacities. Therefore, a certain balance needs to be achieved.

These factors form the basis when considering suitability. Although there might be more external factors, these together already might give a well-grounded insight into the suitability of an RBF mechanism.

7. Feasibility of RBF

This chapter will discuss the results for the third sub-question: “*To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) feasible?*”. In this case, feasible refers to if it is actually possible to execute the RBF program. While the last chapter about suitability focussed on external barriers, this chapter about feasibility focuses mainly on internal barriers to the program's execution. Multiple stakeholders execute the internal process, and these internal barriers are different per stakeholder. Therefore, in this chapter, the stakeholders and their capacities are discussed in order to research the feasibility of an RBF mechanism.

There are many stakeholders who are part of the process, which should be present in the context and should possess the needed capacities [5] for an RBF to lead to good results. The stakeholders considered here are the donor (6.1. Donor), principal (6.2. Principal), agent (6.3. Agent), end-user (6.4. End-Users), receiving government (6.5. Government), verification agent (6.6. Verification Agent) and manufacturer (6.7. Manufacturer) (see Figure 7.1.). Especially the principal plays a central role because the principal is responsible for the program in the end. Therefore, the principal's responsibility to the other stakeholders is vital and will be discussed in each section, besides the capacities and responsibilities of the stakeholders themselves. There might also be other stakeholders, but these seem to be the most prominent stakeholders, and therefore, these are considered more in-depth.

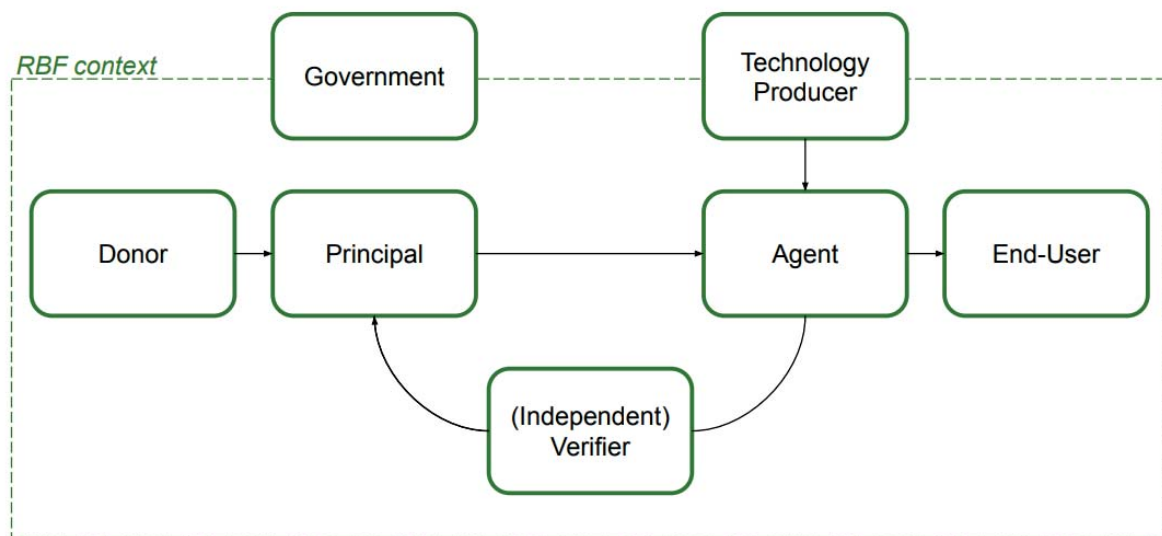


Figure 7.1. Example of stakeholders in an RBF mechanism.

7.1. Donor

The first vital stakeholder is the donor. In this case, a donor is a person, company, government, NGO or any other form of organisation that offers its financial capacities to a program and finances the subsidies. Without these financial capacities, a program cannot be executed [D]. A program can be financed by one or multiple donors. The interest of donors in RBF seems to keep increasing over the years due to the many advantages of RBF on the donor side (see Chapter 4) [J]. Although, if donors see RBF as a holy grail, it might lead to disappointment for the donors because RBF is not able to solve all problems. Therefore, it is important the principal communicates with the donor(s) about their expectations and aligns these expectations to create a reliable program [M]. The prominent donors are the World Bank and governments [D], but also companies have become more and more

interested. Although the interest increases, the energy sector is still lacking investors [C]. Therefore, new donors need to be attracted. To attract donors, it is interesting to present investment opportunities in a format that investors want to invest in. For example, a food company might be more interested in clean cooking than an IT company, so these might be more interesting to attract for an RBF program for CCS [C].

A well-developed structure in financing is of high importance. Interruptions or delays in the disbursement of funds can have rigorous effects on agents because, in many cases, the agents are dependent on the timely and complete receipt of the subsidy when they meet the contractual conditions. Without these conditions, agents can face bankruptcy or high financial debts. Especially for the smaller companies, it means that when an RBF structure does not have the financial capacities it promises, its reliance can be catastrophic. Therefore it is vital to be sure the financial capacities are in place on the donor's side when deciding upon the feasibility of the project. On some occasions, the donor and principal are the same entity, but in other programs, these are different parties [L].

7.2. Principal

The principal is the executor of the RBF program (*see Chapter 2.1.*). The principal e.g. arranges the donor's funds, creates the structure of the RBF, selects the agents, and decides upon the disbursements. Therefore, the principal has a central position in the context of an RBF program. For the feasibility, a principal should first look into its own capacities. The principal should mainly consider if there is enough institutional capacity to construct and monitor the RBF mechanism and for example, ensure good communication, a sound design, and quick disbursements when the results are verified [10, E]. Also, the principal should understand the market, the used technologies, the context, the stakeholders, etc. [E]. And, the principal should be able to manage the whole program [J].

Furthermore, the principal should be able to be flexible when necessary. A market and context will not be static, so the program should not be static either. So when circumstances change, a principal should have the flexibility to adapt [N]. Without these requirements, the RBF mechanism might malfunction, disturbing the market and having the opposite effect of the actual goals [10,J].

Secondly, the other stakeholders need to be explored. Therefore, part of the feasibility is an in-depth stakeholder analysis. The analysis explores if the needed stakeholders are present, if these have the right capacities and how these should be involved in the mechanism [5]. For example, agents should have the right capacities. EnDev had a significant challenge when the agents' business skills were overestimated, especially those of small companies. Capacity issues were an underlying problem. These problems could have been avoided with a more in-depth analysis beforehand [10]. Also, a stakeholder analysis shows how alignment building among stakeholders with shared objectives can occur, and how a plan is made for the engagement approach for each stakeholder. It remains a challenge to find an effective way to collaborate with all stakeholders involved. Suppose the stakeholder analysis shows that specific stakeholders cannot be reached or alignment between stakeholders appears impossible. In that case, an RBF might not be the proper mechanism in the end [5]. A good overview, alignment and a good stakeholder strategy are essential to be successful [10].

Another part of the feasibility for the principal is the analysis of the current aid programs of principals in the region [C]. If a current program already fulfils the goals of the newly planned program, implementing the new program might be unnecessary and lead to undesirable situations. One of the principal interviewees mentioned: "my experience was you are competing with other NGOs". This situation was ineffective [K]. However, also, when there are different programs, it is valuable to know about them. The newly planned program remains additional, but there might be opportunities for collaboration and mutual learning [10,L]. In this case, aligning incentives between principals is

essential [5]. At the moment, there seems to be a lack of harmonisation among principals [C]. The broader the approach, the higher the harmonisation seems to be, but still, there are many parallel structures [8]. Not only alignment between principals is essential, but communication between all stakeholders is of significant importance, for example, for information sharing and defining who takes responsibility [1,C,N]. Overall, a suitable context analysis helps to tell us if an RBF mechanism is likely to be feasible in practice.

The feasibility is also dependent on the credibility of an RBF. Also, in this case, the principal plays a crucial role. The credibility increases if the principal has the suitable capacities and therefore forms a trustworthy partner. So, the capacities of the principal are crucial [10].

7.3. Agent

The next stakeholder is the agent. An agent is a company, NGO, or another form of organisation that arranges the technology or service that will be provided to a customer, which is the end-user in the stakeholder map (*see Chapter 2.1.*). The agent applies to the RBF program constructed by the principal, and when the aimed results are met, the agent also receives the subsidy from the principal. In most RBF programs, many different agents together form the stakeholder.

Not only principals do need sufficient capacity. The successful implementation of an RBF mechanism in a project requires capacities like advanced institutional capacity and appropriate legal arrangements of the agents as well [4,F]. For example, a measurement approach needs to be set up for the verification because the data must be correct [4,5]. Therefore, sufficient institutional capacity to set up the structure to receive an RBF incentive is necessary. There are several phases for an agent in which capacity is needed.

Firstly, an agent needs enough capacity to know about the existence of programs [A]. Not every agent has the network or language skills to retrieve the information about an RBF program. Here is a role for the principal to make the RBF as accessible as possible. However, because not all programs are widely spread, also the agent needs the capacity to reach out. So, the right network and the applicable language skills are the first capacities needed. Secondly, if the agent learns about the program and chooses to apply, the institutional capacity to apply to the fund is crucial. These applications can be lengthy and complex and, therefore, not always easy to get in [A,E,P,Q]. Thirdly, when getting in companies need the financial capacity to pre-finance and institutional capacity to roll out the project [F,J,N]. This includes planning tools and the managerial ability to map and archive the cash flows from the organisation and the RBF instrument [10,E,P]. Furthermore, in this stage, all skills are needed to actually distribute the products, like technical capacity and marketing skills [B,F,J,K,N]. Some programs, therefore, offer training and technical assistance in order to improve these capacities [B,F,K]. And fourthly, agents need capacities to get through the verification phase [A]. The collection of data and good documentation of it is very important in order to be verified and requires institutional capacity as well [E,F,G].

As mentioned before (*see Chapter 6.3.*), large companies have an advantage because they are more likely to be in possession of higher capacities. Large companies need already more institutional capacity to manage the organization, have more manpower to execute tasks, can take advantage of economies of scale, which translates into lower prices and have generally more resources to be capable of pre-financing the project [1,3,5,A]. Smaller companies do not have these advantages [1,3,K]. Here is also a role for the principal because it does not mean small and early-stage companies are necessarily excluded, but extra support might be essential 1,A]. Another reason sufficient capacity on the agent's side is necessary is that solid local ownership of the project by the agents is essential to guarantee that the impact is not reversed once the program has come to an end [9]. Furthermore,

it takes time before an agent is familiar with the RBF, the market, and other stakeholders in practice [12,14]. An agent should be able to deal with the delay between the start of the project and the disbursement and bridge the time between this financial gap. A behavioural change on the agent's side to comply with the restrictions and goals of an RBF program might be needed, and this should be feasible [4]. Another challenge of RBF in practice seems to be the power of non-disbursement held by the principal. This is an extremely strong source of bargaining power that might lead to a power imbalance between principal and agent [8]. Also, agents might have unrealistic expectations for awareness among users and underestimate their role in the stimulation of demand [11].

7.4. End-Users

In the energy sector, the end group that needs to be reached in an RBF program is the end-users. This group can actually change its energy consumption and the way energy is used. Therefore, the envisioned end-user appears to be crucial when considering the feasibility.

The right end-users and agents must be addressed [11]. Not every target group is feasible for an RBF mechanism. The choice of these end-users included in the RBF mechanism depends on the envisioned goals, translated in a focus on a particular target group. It is especially important to subsidise the technologies for the poorest households [8]. However, some very poor groups like refugees in rural camp settings have mainly unpredictable income streams. RBF seems to be not the best instrument in these settings because of the severe inability to pay for energy services and high fluctuations in the circumstances resulting in high risks [1]. Although not everyone believes it is in the hands of the principal who is actually targeted [J], in general, it can be said that the current characteristics of RBF end-users targets are: low and seasonal income levels, low access to technologies, high consumption levels of freely collected firewood and high outreach costs [1,D,E]. A principal can steer in the direction of these characteristics, but it can be challenging [D,E].

Therefore, it is significant for the feasibility if it is feasible to target the envisaged target group of people. There are differences in the impact and RBF approach between target groups. For example, gender is an essential factor when considering the impact. Research shows that mainly women and children benefit from improvements in CCS [1]. However, also, gender affects the way people can be reached and targeted. Women seem to show a higher ability for purchasing technologies with a one-off payment, while men prefer purchases with a credit option [1]. Another difference is how people can be reached. In India, demonstrations of CCS were combined with health checks on women and children. This became an integral part of the awareness campaigns and reached many women [12]. This shows it is not only important to choose the right target group to reach the envisioned impact, but it is equally essential to embed the perspectives of these end-users in the design of the projects in the RBF [3].

To be sure if an RBF will fit well, the best way is to test the RBF. Testing the RBF can be essential to guarantee its success or avoid problems with the RBF mechanism [3,12]. Also, especially for RBF, meaningful engagement is important because these projects are more dependent on indicators and statistics [9]. This prevents the non-understanding of end-users. At this moment, the end-users are not always taken in mind. A good understanding of why users purchase technologies and what they value in a product is lacking in many cases, leading to RBF problems [3]. Also, more holistic approaches which emphasise the end-users perspective are currently missing. As a result, there is an underexplored opportunity to include end-users in RBF design [1].

This also leads to mismatches between the stakeholders. There seem to be different perspectives of the principals and the agents in research, as a case from Nepal shows. Principals named the awareness issues among end-users the most significant barrier to adopting the technologies. On the other hand,

the agents think that most end-users actually do understand the benefits, but that the main barrier is that end-users do not know how to use it and want better support. This difference is an important mismatch between how agents and principals think about the end-user's perspectives [3]. Therefore, for the feasibility, it is important not only to consider addressing the barrier of awareness [K], but also the barrier of usability. In the same research, there seems to be another difference in perspectives. While principals name the affordability of the technologies as a barrier, agents think that the situation is much more complex. They suggest that most end-users already have satisfying technologies and that especially cooking is not a priority for investment in many households [3]. The outcome should come out of good context analysis and help to understand if the RBF mechanism can help or if other tools and approaches are necessary.

Mismatches may cause problems and, more importantly, worsen the situation for people who are envisioned to be helped by the RBF program. RBF does not always promote equity because evaluations show that agents in poorer countries face more problems securing funds such as an RBF. Also, within a country, there might be equity problems. In this way, an RBF can widen the gap between rich and poor people if the RBF program and its target group are not adequately designed [4,D,]. This is a significant challenge because if guidelines are not followed adequately, because of e.g. corruption, this has a significant and disproportionate impact on poor people [9].

Another significant barrier for end-users is the upfront costs of SHS and CCS. Therefore, also end-users need the right capacities. There are possibilities to ensure consumer awareness that can overcome false perceptions of the too-high cost of SHS and CCS. For example, a higher tier CCS is five times cheaper than charcoal, but still, the costs of CCS are perceived as higher. Moreover, it might overcome the idea that all meals are tastier from charcoal stoves [1]. Also, the perception of users on the costs of the technologies plays a vital role in the adoption of RBF funded technologies. For example, many users perceive the relative costs of electric CCS as higher than charcoal, while actually, it is by average five times cheaper [1]. In this way, the perceived affordability of technologies seems to be one of the main issues for adoption. A lending mechanism or leasing technology system seems insufficient to overcome this issue [1,3,10].

7.5. Government

In this case, the government refers to the authority that governs the area in which an RBF is situated (Cambridge Dictionary, n.d.). A government is responsible for the regulations in an area and people's compliance to these regulations. In this way, a government influences the context in which an RBF program is implemented, and therefore it is a stakeholder to consider.

Before implementing the RBF, a principal should consider if the regulations, the prospects of regulations and the political priorities are in line with the RBF to decide on the feasibility of the RBF program [5]. This can help to ensure alignment of the mechanism and the context and get an idea if the goals of the results-based financing fit into the country's strategies [5]. In some cases, it could be that the country's policies counteract the RBF, which leads to problems in the RBF. For example, in Tanzania, some programs were implemented to develop the private off-grid solar sector, while the government decided they wanted to focus on on-grid energy generation. Therefore, the government increased the taxes on off-grid solar, which decreased the number of companies in the private sector [D]. This shows the regulations and the prospects are essential for assessing the feasibility of RBF.

While the influence of a government on the context is considerable, including the government in the RBF program itself is not always desirable. While the stakeholders mentioned before are central to the program, RBF programs are mainly donor-driven, and national governments seem to play a minor role in the RBF programs themselves [1,3,0]. Arguments for not including the government are that

non-parallel programs could raise funders' concerns about unaccountable and weak governments and the government can make the process more complex and lengthy [D]. Furthermore, some governments encourage programs in their country and create an enabling environment. These governments do not necessarily want to be involved themselves [B,M]. On the other hand, some mention that governments should be included [C,D,N]. It could lead to a more coherent and connected aid and policies and to more sustainability of the goals of the programs [C,D]. Also according to Pereira and Villota, RBF programs, but also other programs should not be implemented without collaboration with the national government [8]. Parallel programs can undermine the capacity of the countries' governments. Without inclusion, a donor-driven program might diminish the responsibility and control of national governments. Citizens stop demanding an adequate level of governance by their governments [8]. Also, governments might feel accountable to donors instead of their citizens, and agents feel accountable to these donors instead of their government. In this way, the government is side-lined. This is the result of high pressure with millions of euros at the stake of the donors, which might go to other countries if goals are not achieved. This problem is not only part of an RBF program but of aid in general. It creates an increase in power for the principal and it is upon the principal how to deal morally right with this power [1,8]. This shows that it is a choice to set up a program in parallel or work together with the country's government.

When there is decided to include the government, it can be an option to already include the government in the design of the RBF program. This might help to ensure the success of the RBF because countries own institutions and systems can be used. For example, during the tendering process, the countries' platforms and infrastructure can be used, making it more inclusive to all organisations. Also, transaction costs might be reduced by reducing the number of parallel systems. This leads to strengthening the aid effectiveness of the approach [9].

7.6. Verification Agent

A verification agent is a party that checks the accuracy of the results accomplished by the agent (G). This information on the accuracy is communicated to the principal in order to disburse the funds to the agent. It is important the verification agent is independent. Partnering with an independent verification agent (IVA) strengthens the RBF, increases accountability and reinforces effective reporting processes through more experience [1,5,F,L]. This is positive for the principal, but also, an independent verifier increases agents' confidence in the reliability of the process, which is important to a reliable RBF. Therefore, many people believe a third-party verifier is necessary [6,F,G,L]. Therefore, in most programs, an independent verifier was used [12]. Furthermore, moving coordination and verification under the umbrella of existing stakeholders will reinforce transparency and accountability.

However, an independent verification agent seems necessary, it is not always easy to find one [F]. The verification agent must have a lot of capacity to execute its responsibilities. Not a lot of organizations are adapted to the role of IVA. Often an organization needs a lot of capacity building and needs to adapt to its role as IVA [F,G]. Therefore, time is needed. If the program starts and the capacities are not in place, this might lead to several problems. Firstly, the verification process might include failures leading to fraud and gaming [G]. This results in too high or non-fit disbursements, which cannot be used correctly by other players in the field. Subsequently, this might lead to distrust on the donor's side and therefore decrease in funds. On the other hand, when failures point toward non-reached results, these can result in non-disbursements for the agents, which might have many adverse effects like bankruptcy [9,G]. Furthermore, verification needs a high level of institutional capacity. In many cases, verification is a complex process [L]. Therefore, it should be investigated thoroughly if a fit verification candidate can be found [9,G]. A fit IVA is crucial for the feasibility of an RBF program.

7.7. Manufacturer

The last stakeholder is the manufacturer or the technical producer of the used technologies. The technology producers are critical because they produce the technologies used in the program. Without the technologies and the infrastructure to distribute the technologies, the RBF mechanism has no feasibility of being executed. In many cases, the manufacturer is situated in another country than the target country. Therefore, in these cases, relationships need to be built with manufacturers in other countries [K,L]. It depends upon the design of the RBF mechanism if this is the role of the principal or the agent.

Moreover, suitable technologies and structures are essential [1,K]. In some cases, these technology producers should adapt the technology to the context and innovate. When this is the case, the manufacturer needs to possess the capacity to adapt the technology. When a technology does not fit into the context, this can lead to an unfit technology and, therefore, non-usage [1]. In this way, buying technology does not mean it is actually used by the end-users [3]. For example, in CCS, energy-stacking is a phenomenon, which means when people have a CCS, it does not mean all cooking is replaced by CCS when a CCS is installed, but the old technologies stay in place and maybe only one meal a week is cooked with the new CCS [3].

7.8. Chapter Conclusion

This section aimed to provide the results for the third sub-question: *“To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) feasible?”*. For the feasibility, the most prominent stakeholders and their capacities were considered. When these stakeholders and their capacities are not in place, an RBF might not be feasible. In general, one or multiple donors, a principal, agents, and end-users are crucial and also the receiving government, verification agent and manufacturer play an essential role. All these stakeholders need to have the right capacities, like institutional, network or financial capacities.

Donors mainly need financial and institutional capacities to disburse timely and complete according to the agreements made. A principal needs many different capacities. Institutional capacities need to be strong in order to function correctly in all its activities. Also, because many stakeholders are dependent on the principal in their activities in the RBF program, a good reflection of the principal, if it is able to live up to the expectations, is vital. The agents need strong enough financial capacities to pre-finance the project and solid institutional capacities to adhere to all the requirements for the program and especially the verification process. Also, other capacities like proper communication and network capacities help to find out about RBF programs' existence, which is essential. For the end-users, mainly the capacities of the agent appear to be vital because efforts on the side of the agent (and to a certain extent principal) e.g. can increase their awareness, might encourage them to buy a device or service and offer them the opportunity to get it as well. The receiving government is also essential because of their ability to influence the context, but also because the government might help improve the program. However, the degree of influence also depends on the principals' willingness to include a government in the program. The next stakeholder is the verification agent. An independent verification agent strengthens the RBF and is therefore desirable. Strong institutional capacities are needed to verify all the reached results timely and thoroughly. Mistakes and delays can have significant effects. The last stakeholder is the manufacturer. A good manufacturer needs to be present in order to be able to build a suitable technology.

Without all these stakeholders and their capacities, an RBF cannot be executed. Not only separately the stakeholders and specific capacities are needed, but also together these should fit. Only then an RBF is feasible.

8. Design of RBF

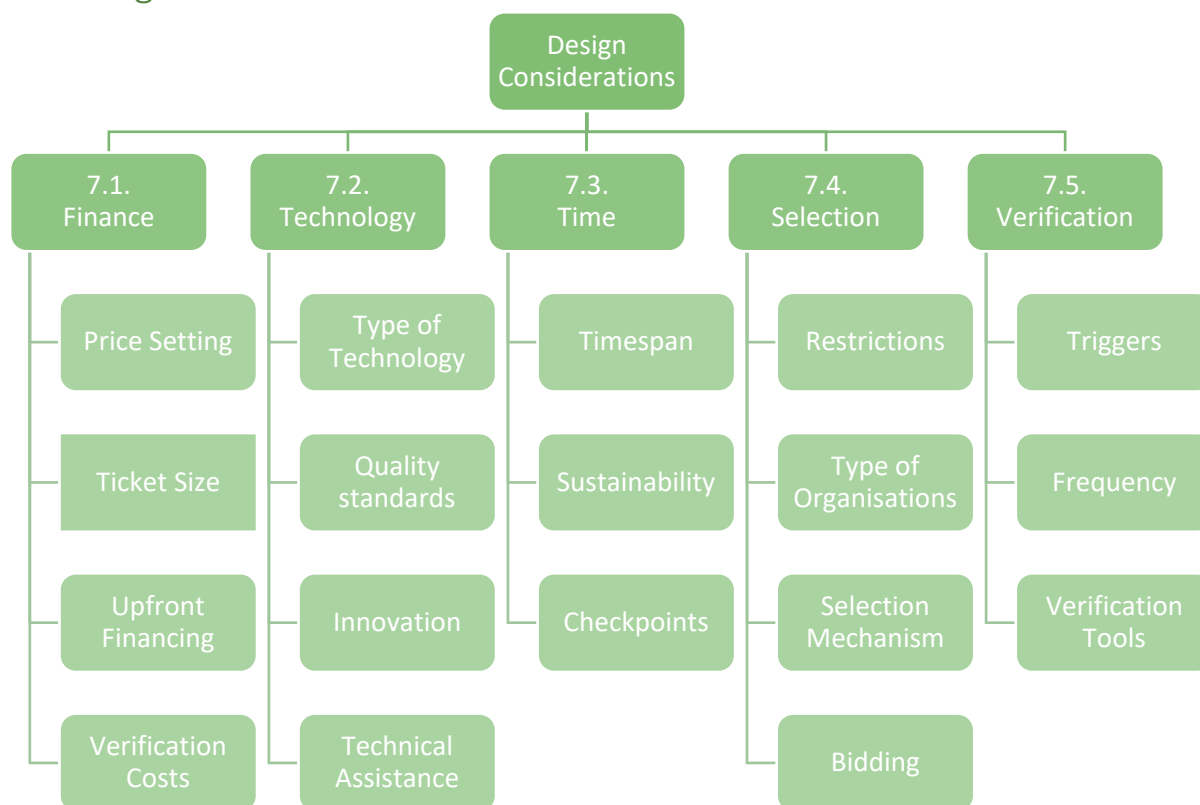


Figure 8.1. Design considerations.

The program can be designed once the choice is made in favour of RBF because RBF appears to be desirable, suitable, and feasible. This led to the fourth and last sub-question: “*What important considerations need to be decided upon with respect to the **design** of results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS)?*”. There are a lot of different decisions to make in the design of an RBF program. Some decisions are more significant and have a higher impact on the program than others. This chapter gives a brief overview of the most prominent factors of consideration in designing an RBF program, which came forward from an analysis of the literature and interviews.

These factors are divided into five sub-sets of considerations. Firstly, the finance of an RBF program is discussed. This part is divided into three components: price setting, ticket size, upfront financing, and verification costs (**7.1 Finance**). The second set of factors is about the technologies used in the projects. Here, the four factors type of technology, quality standards, innovation and technical assistance are discussed (**7.2. Technology**). Thirdly, the timespan, checkpoints and the sustainability of the RBF program are discussed in the sub-chapter about time (**7.3. Time**). The fourth sub-section is about the selection procedure. This section elaborates upon the restrictions, type of organizations, selection mechanisms and bidding mechanism (**7.4. Selection**). Lastly, the verification process will be discussed with the help of the factors triggers, frequency and verification tools (**7.5. Verification**). These are all shown in figure 8.1.

8.1. Finance



Figure 8.2. Factors considered in Chapter 8.1. Finance.

This report looks into RBF, which provides a supply-side subsidy for the private sector. The finance of this subsidy is crucial. Therefore, firstly, the price-setting per unit of output is an important factor here. Secondly, the ticket size used in an RBF program is discussed. Thirdly, mixes of RBF with upfront financing are interesting to consider when designing an RBF. Fourthly, the verification costs are of extra importance in an RBF. For the factors, see Figure 8.2. All these factors are further explained in this sub-chapter.

Price Setting

To ensure incentives are aligned with the intended impact, the first consideration is how to design a correct payment design. In the payment design, the amount of funds is set for each output. The price should be high enough to incentivize the agent to reach the objectives set by the principal [F,K]. However, at the same time, it is important for a donor to be cost-effective. Therefore, the price should not be too high because then the additional money has no additional value to reach these objectives.

It may take some time to set the right price [F]. With the help of data, appropriate amounts for the funds can be decided upon [5,9]. An excellent way to retrieve data and information is testing and piloting an RBF before broadly implementing it [12,13]. Especially, because the mechanism is relatively new in the energy sector, not a lot of data is available. Piloting also helps reduce the RBF costs because errors can be ruled out [5], and the RBF mechanism can be adapted to the context. But also when implementing a program, flexible financing is a critical success factor. The price settings may still be adapted during the RBF, because incentives appear to be too high or too low [C,D,F]. Adapting the incentive payment levels is done in several cases and can be done quickly. However, this needs careful consideration [D]. Especially lowering incentive levels requires careful consideration because organisations might be relying on the higher incentive levels and in that case face problems when these are lowered. It also increases the risk for an agent, which might result in fewer applicants to the program [C].

Furthermore, the appropriate amount of incentive might move during the program. For example, when additional barriers occur, the price per result might increase, while if barriers are removed, like when the market develops, the price per result might decrease [D]. Also, because of sustainability reasons, the incentive levels might decrease (*see 7.3. Time - Sustainability*). One example is a program in which the incentive was decreased every year of the program with 20% to increase sustainability [L]. To conclude, a correct price setting is important and takes quite some consideration to do so in a right way and even needs consideration during the running of the RBF program.

Ticket Size

The height of ticket sizes is essential in an RBF. A ticket size is the minimum and maximum amount of subsidy given to one single organisation during the timespan of a program. There exist smaller ticket sizes, which already disburse subsidies at the minimum ticket size of a thousand euros or more, but there are also subsidies existing that start only at 100.000 or even a million euros. On the other hand, also the maximum amount of money differs significantly among different programs. A wide range of minimum and maximum amounts of subsidy is needed to reach all different organisations in a market and offer the same opportunities for everyone [N].

To decide upon the ticket size, it is important to consider several factors. Firstly, the size of the tickets influences the organisations that are attracted. Smaller ticket sizes make larger organisations wonder if it is worth it [A,E], while bigger ticket sizes with a high minimum may be unreachable for smaller organisations [B,P,O]. Secondly, the wrong ticket size might lead to market disruption. Larger or smaller ticket sizes might exclude players from the market. Also, market disruption might take place because when higher ticket sizes are set, larger organisations outperform smaller organisations and receive most of the incentives (see Chapter 5.3. Market Disruption). Thirdly, the cost-effectiveness might be influenced by the ticket size. Smaller ticket sizes are, in general, less cost-effective because of the relatively high verification costs compared to the disbursed subsidy (see 7.1. Finance - Verification Costs). On the other hand, larger ticket sizes are more cost-effective because of the relatively low amount of money spent on the verification process when larger amounts of results are verified. This is another important factor. Fourthly, smaller ticket sizes generally take more time and require more effort on the principal's side because (with the same amount of funding available by the donor), smaller organisations mean more participating organisations. This can make the program more complex to manage. Therefore, smaller ticket sizes require more institutional capacity in general from the side of the principal [F]. Fifthly, another factor to keep in mind is the financial capacities of the donor. Larger ticket sizes might require more funding if the aim is to involve multiple organisations. Smaller ticket sizes might require relatively more funding on the verification part. Furthermore, if certain ticket sizes are lacking in the market, it might be interesting to look if there is interest in these ticket sizes to balance the market and not compete with other subsidies [C]. These are several factors that are important when deciding upon the ticket size.

Moreover, within ticket sizes, flexibility is also needed. For example, one principal faced the end of its program, but there were still funds left over. Therefore, the maximum ticket size was increased for the bigger organisations, so the money would still be spent on these projects, but at the same time, smaller organisations had the opportunity during the program to participate in RBF [F].

Upfront Financing

Thirdly, a choice needs to be made between a pure RBF or a mix between RBF and pre-financing subsidies. A mix between upfront financing and RBF is needed in some circumstances, especially when pre-financing capacity is low [5,10]. Because of the high uncertainty, it might not be appropriate to tie the funds 100 per cent to results. It creates excessive risks, and therefore RBF on its own might not be enough [5]. Small and local companies are more likely to engage in the RBF program when a pre-financing subsidy is offered. Therefore, upfront financing can make an RBF program more inclusive [D]. In this way, the inclusion of upfront financing and RBF together is even a major opportunity to diversify the spectrum of participants [1]. Also, one of the interviewees mentioned: "upfront payment will actually help you to accelerate and quite significantly". Agents do not or to a lower extent face the usual barriers of securing pre-financing themselves. Subsequently, the project's first phase is accelerated, and therefore the whole project is accelerated as well.

On the other hand, there are disadvantages of including upfront financing. There are higher admin costs and the advantages of RBF might be lowered [D]. Also, less strong organisations might apply because these do not have the financial capacity to pre-finance [H]. Therefore, pre-financing is seen as a trade-off. An example given of the practical implementation of upfront financing in an RBF mechanism is the case that a part of the RBF subsidy is given by calculating what the organisation might get when it reaches its results in the first years. A percentage of the total amount is given upfront [L]. The option of pre-financing subsidies shows that RBF can be considered as one element of a toolbox and not a stand-alone tool [11].

Verification Costs

The fourth consideration is the verification costs. In the end, a verification process should be reliable, fair and cost-efficient (see 7.5. *Verification*) [11]. Nevertheless, high certification and verification costs are a problem. The verification costs can be relatively high compared to the given RBF subsidies and cause challenges. Because other (upfront) subsidies do not need the whole verification process, the high verification costs are seen as a main disadvantage of RBF [1,5,9,10,D,G]. Therefore, for a verification agent, the biggest challenge is to execute verification more efficient and cost-effective [D,G].

The level of the verification costs is dependent on several factors. Firstly, the tools used for verification are crucial. For example, a tool that uses data analysis is in general cheaper than a tool that uses field visits for verification. Secondly, the number of units verified might change the costs of verification per unit verified. Because, for a reliable sample, the size of the sample is not very different for 1000 units that need to be verified or a million units that need verification. Therefore, when samples are used, which is generally the case, the smaller the number of units that need verification, the higher the costs of verification [G]. Subsequently, there seems to be a trade-off between the inclusion of smaller local players at higher costs and more sophisticated, standardised verification methods at lower costs [1,G]. Lastly, the frequency of verification plays a role in the costs. The more frequently the whole verification process is executed, the more costly it can be. So, the costs should be balanced with the number of results that will be verified, the frequency of verification and the tools used to verify [G].

8.2. Technology



Figure 8.3. Factors considered in Chapter 8.2. Technology.

The next considerations are about the technologies in the program. Four important considerations are discussed. Firstly, which technologies are allowed within the RBF mechanism. Secondly, which quality standards these should have. Thirdly, to what extent is innovation important. And lastly, does technical assistance need to be included. For the factors, see Figure 8.3.

Type of Technology

Firstly, a choice should be made on the decision of which technologies need to be included in the program. There are several energy technologies, like the ones in this research paper considered: solar homes systems and clean cooking stoves. A decision needs to be made on which are included in the program. SHS has high potential, and also the demand is growing [M]. SHS programs are already more developed, and therefore the technology is more standardized and systems are created like data systems that can be used in the verification phase [I]. However, there is a transition going on from a main focus on solar systems to more of a focus on clean cooking as well. This change brings new challenges because the products and payment systems are quite different [I]. Also, because CCS is still relatively new, it faces higher barriers like lower demand [M]. However, on average, for CCS, lower amounts of funding seem to be needed per unit of technology than for SHS [14]. There is not always a need to choose between the technologies. The technologies can both be part of the same program and the technologies could even be part of the same project [1]. Also, additional technologies can be added, like mini-grids. Therefore, the first consideration is which types of technologies to include and which not.

Quality standards

Secondly, there is a wide range of different quality standards within these technologies. Reducing the amount of greenhouse gases and subsequently e.g. climate warming and health issues are essential end-goals of RBF. The quality standards of the technologies determine the level at which greenhouse gases are reduced. The higher the quality standard, the more greenhouse gases are reduced by the technology [10,E]. Therefore, high-quality standards are most likely to adhere to the set goals and adhere to SDG 7. Subsequently, high-quality standards are set in several projects [E]. But, there are several downsides to high-quality standards, like the aspects that these technologies are generally more expensive, require more extensive changes and might be more complex. Therefore, adopting higher quality standards can interrupt and cause delays to the RBF project. Also, higher-quality technologies are not always available or are a step too far. Furthermore, slightly higher incentives, like higher tiers, do not necessarily correlate with a higher uptake of technologies [1,B]. Also, too tedious technical criteria might exclude certain firms by default [6,11]. And even the admitted companies might want to cut costs that compromise quality and not adhere to the set and agreed on quality standards of the RBF [1]. This might undermine potential demand [6,11,B]. Therefore this should be carefully monitored and taken into account. This leads to higher verification costs. Moreover, new technologies are not always better in usability and user-friendliness. However, demonstrations of the technology can enhance understanding and user-friendliness [12]. So, it is a challenge to design technologies that households are willing to use and adhere to the donors' standards [13]. Therefore in some cases where the cookstoves tier appeared to be too high, lower tiers also needed to be allowed. E.g. improved charcoal stoves appeared to be nascent, while these were below tier 2. So these were also included. Although, there might be lower pay-outs for lower tiers [1].

So, the disadvantages of high-quality standards make agents, in general, prefer lower quality standards. High-quality technologies might lead to lower adoption rates but also to lower levels of greenhouse gas emissions. In contrast, technologies with lower standards and more financially affordable and simple technologies might be better suitable but are more polluting [B,E]. Therefore, a balance in an RBF between high adoption rates with lower quality standards and lower adoption rates with higher quality standards should be considered. This consideration was also shown in some projects. The level of financial incentive provided by higher tiers pointed over time in the direction of allowing lower quality and tier standards as well [1]. Furthermore, in the broader programs, the cheap and small products predominate [14].

Innovation

The third consideration is to what extent innovative technologies are admitted to the program. There remains a need for innovation and adaptation of technologies in the energy sector. Therefore, within CCS and SHS, a lot of innovation is going on. RBF might be a way to enable the testing of new solutions [1]. Pilots are also very helpful in this process [12] to adapt the technologies and systems to the end-users. Only robust testing can provide information on what local adaptations may guarantee the relevance of the technology [12]. On the other hand, like mentioned before, RBF might not be the most suitable mechanism for innovation because of the high risks attached to innovations. If the innovative technologies are not adopted, this will result in non-disbursements which can have highly negative consequences on these organizations. Therefore, agents might not want to interfere with innovations, but also some RBF programs require only proven technologies to ensure a stable program [L].

Technical Assistance

The last consideration is the consideration if technical assistance is necessary. Technical assistance (TA) is the transfer and adoption of skills and knowledge regarding the technologies. Technical

assistance in projects can be given in two ways. Firstly, the principal can give technical assistance to the agents and secondly, the agents can give technical assistance to the end-users. The first way of TA can support agents in their activities and decrease the risk of the fall-out of agents in the program. Especially small companies might benefit from TA to agents because, in general, the capacities, and therefore knowledge about the technologies, are more limited [N]. However, the offer of TA might require more effort and time on the side of the principal. Therefore, the first consideration regarding TA is the need to implement TA for the agents.

Secondly, TA for stakeholders in the field, like end-users, agents or manufacturers, helps to a.o. create awareness, decrease the risk of de-adoption or non-adoption¹⁴, improve the product design, and collect and manage the data [1,5,K,L,N]. Therefore, TA is often needed to ensure participation and lasting market transformation [11,12]. Not all projects include technical assistance. To be included, there should be incentives for agents to include TA and inform consumers about the technical standards and usability. Incentives could be the prospected increase in demand and the benefit of the collection of data, which supports a sustainable project [1,6,10]. Especially small businesses are less willing to invest in something such as raising awareness because the incentives are too low and the horizons too long [K,M]. Therefore, some programs require TA to be part of the project as a restriction. This is another choice that needs to be made regarding TA.

8.3. Time

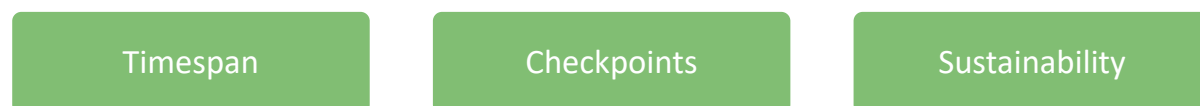


Figure 8.4. Factors considered in Chapter 8.3. Time.

Time is another critical factor. The considerations in time discussed in this chapter are what duration of the program is most effective if checkpoints are needed and how the program can ensure the sustainability of the program's goals. For the factors, see Figure 8.4.

Timespan

The first consideration is what timespan should be used for the RBF program. Although a program's timeline is vital in designing an RBF mechanism, not much is known about the impact of different timespans because RBF is a relatively new mechanism. Especially in the energy sector, RBF has only been used for a small amount of time [1]. However, a short timeline may generally result in high pressure for immediate output. For RBF, it is more likely that a shorter timeframe is used because of the pressure by donors for results [G,H] and the pressure to reach short-term goals in the verification process [3,10]. A longer timeline can focus more on the actual aimed impact and offers the opportunity to adapt to previous evaluations, leading to an improved RBF mechanism [3]. For example, the impact might not be measurable within a shorter timeframe. Therefore, output and outcome indicators are used in many cases [5]. Therefore, the goals are important when choosing the timespan. It can be hard to create the necessary conditions within a reasonable timeframe and at reasonable costs [5].

There is quite some discussion about the ideal timespan. Some research mentions that a project should be at least three years or longer to be successful. Only then an agent has enough time to develop strategies, and in that way, the RBF can be additional [9]. Although, this might not account for all markets. For mature markets, a three to four year period can be enough, but it is unrealistic to

¹⁴ Buying a technology does **not mean it is actually used** by the end-users. To address this problem of too low, de- or non-adoption within the program, technical assistance can help [3].

expect a lasting effect in such a short time period in immature markets. Then it even requires more time [11]. Also most interviewees had an opinion about the timespan. Most interviewees expected three years to be a too short timeframe. One principal mentioned three years as a timespan they used but also brought up that it was not unregular that this timespan had to be prolonged [F]. Another also said three years was the minimum, but five years is more ideal [I]. Other interviewees mentioned the timespan should be at least four years [A,E,H,N], and some interviewees even mentioned five years as the minimum timespan for a project [D,F,J]. One even mentioned that the horizon should be ten years. The interviewee mentioned: “10 years is sufficient to even influence policies, influence standards, a private sector, develop local capacity”. However, from the programmatic point of view, this timeframe can be filled with different (follow-up) programs. [N].

Research shows that at least in the first one or two years, most agents first familiarise themselves with the RBF mechanism before effectively using it [E,I]. A two-year period appeared to be too short [9,12]. In many cases, it might take two or three years before revenues are seen [C,I]. Especially in the energy sector, longer timeframes are necessary because transitions to CCS and SHS and market growth are longer-term developments [1]. It is essential to envision the long-term role of an RBF program in context. Is the role of RBF to catch up, which employs a shorter-term role or to strengthen the field in a longer-term role? It is essential to know the goals and adapt the duration of an RBF to the goals [7]. Additionally, it is valuable to keep in mind that although a certain timespan for an RBF design is taken, this does not mean the RBF is inflexible during this time but can also be adapted within the timespan [5]. Even when the timespan can be extended when necessary, a principal wants to make sure that within the timespan, as much is delivered as possible [D,F] because there are also some negative sides to longer timespans. However, an RBF might be flexible. Certain core principles of an RBF design are harder to change, which might give more inflexibility than two consecutive programs. Also, a lot can happen in a couple of years. Therefore, donors appear to prefer shorter timelines to be less attached to a program. Moreover, longer timespans are, in general, more costly [1,D]. Another important part of the decision on the duration of a timeline is related to the sustainability and will be further elaborated on in the subchapter about sustainability.

Sustainability

It can be said that there are two main end-goals for the principal. First, it could be the goal to create a self-sustaining market. Secondly, instead of focusing on a self-sustaining market, a principal can also focus on a certain amount of e.g. connections or cookstoves [9,10]. To enforce sustainability, especially the first strategy is the best to determine the duration, while the second strategy limits the guarantee for sustainability. This is the case because the market can function on its own after the principal leaves, while in the second case, the market could collapse. Nevertheless, it is important to remember that sustainability takes time [8,9,10]. Also, in the first case, it is essential first to consider how far the market is already self-sustaining and how fast it can move towards a self-sustaining market. Some markets might need more time than others [9,10]. In the second case, the timespan is dependent on indicators like the number of cookstoves [9,10].

Some projects appear to be unsustainable, with agents hopping from grant to grant without adhering to the goals of the programs and altering the direction of the organization every time [M]. To mitigate unsustainable projects, it is essential to include the project's sustainability in the design phase of the program [5,F]. There are several examples of building in sustainability. For example, it might be good to build in a minimum period in which the RBF is guaranteed, but afterwards, it is better to fade out the RBF payments. In this way, agents can prepare for the end of the funding and strengthen the organization so it can function without the funding [10,F,K,M]. However, a longer timespan might be necessary to fade out because it is important that this is done after the market picks up the

technology. This already might take about two or three years, so another few years is necessary to be able to fade out [F]. Also, another way to guarantee sustainability is that the principal still keeps contact with the agents and supports them in other ways like training and networking [F]. Furthermore, when the goal is to expand the market to new areas, facilities need to be built, people need to be trained, and contacts need to be made. In these cases, it is likely also demand will develop in the market, and it is less likely that this will be all abandoned when the subsidy stops [A,J]. Lastly, to sustain the developments, it is important to keep reconsidering the RBF design to see if its effectiveness can be enhanced [4].

Because RBF is a time-bound mechanism, it limits sustainability [3]. In many cases, limited or no support is given in the long term, which compromises sustainability. To sustain progress, more institutional changes can be needed [2,6]. Limited ownership of the agents and the home country is often a challenge in ensuring sustainability [3].

Checkpoints

To create a reasonable timespan, it is crucial to make decisions on the duration already during the design stage to be able to communicate the timespans clearly to the agents. Unnecessary disruptions can be avoided, making it possible for the agents to look for other strategies [10]. To build in more safety for the agents, it can be helpful to build in intermediate checkpoints, which are communicated clearly to the agents [D,E]. Examples of checkpoints might be that the first payment is done once the company can demonstrate that they have imported products, hired most sales agents or have set up warehouses. For each checkpoint, it should be outlined what the next steps are and on what grounds the following steps are taken [D].

Another option could be that with each checkpoint, the RBF payment is lowered to create a sustainable mechanism. For example, if at the time of the checkpoint, this target is met, then the RBF payment stays the same or reduces by 20 per cent. These steps should be known explicitly. What should be kept in mind is that gaming should be avoided, which means agents deliberately underperform because of certain checkpoints [10]. Therefore, it is essential to think about the setup carefully. More checkpoints might mean more verification, leading to much higher costs. One of the interviewees advised not to do more than three checkpoints for that reason [D].

8.4. Selection



Figure 8.5. Factors considered in Chapter 8.4. Selection.

The next consideration is how to select the agents for the program. What sort of organisations are involved is one of the important first steps for the selection method. Also, restrictions are set. Certain restrictions are already decided upon, like the technology agents should use. But when multiple organisations adhere to the selection requirements, it becomes essential if and how these organisations will be selected. A bidding mechanism is frequently used and will be discussed more in-depth. For these factors, see Figure 8.5.

Restrictions

For each program, several restrictions will be given to an agent in order to be selected. The amount of restrictions depends upon the degree of freedom given to the agents. Research shows that in many RBFs, agents are given the freedom to determine their own regional outreach strategy. This is not always desirable. For example, when agents mainly focus on urban or peri-urban customers who are

already connected to the grid and have a slightly higher income. In this case, actual groups who are not connected to the grid and have a meagre income are neglected in this system [1]. Therefore, the restrictions on who is reached with the program should be more strict if the goal is to reach vulnerable groups.

Therefore, one example of restrictions can be the group, area or country reached. A couple of other restrictions are mentioned before, like implementing the right technology, the quality of the technology or giving TA [F,J]. There are also other restrictions that are not mentioned before, like that the organisation has existed for a number of years, is doing business in the energy sector and/or has a certain track record [H,N]. Also, for the expectations of sales with the subsidy, a minimum number might be set and be a restriction in order to be part of the subsidy program [F,N]. Furthermore, there are restrictions that there cannot be bought arms or products that harm the environment. There are sometimes even social restrictions, like gender restrictions [D].

Some restrictions are very hard and others are more soft. Most mentioned above are used as hard restrictions. An example of a soft restriction is when a certain level is not reached, but because of potential in the project, the project is still admitted. This can be a limited quality of the project plan or sustainability plan. If the quality is not reached, but there seems to be potential in the plan, the project can still be admitted. The plans can be improved with the help of the principal and, therefore can be seen as a soft restriction [H]. All the restrictions together form a system in which the project and agent should fit. If this is not the case, the project and agent can be refused to be part of the program. Therefore, it is essential that decisions are made upon a good system of restrictions.

Type of Organisations

The restrictions affect the type of organisations that are admitted. As mentioned before, RBFs are most successful for companies that have already overcome early-growth stages, gained essential market experience and transitioned to consolidate further. More minor, early-stage companies would need more help, other constructions or other types of financing [1]

Although some organisations might be more eligible to participate in an RBF program and are less risky, donors and principals must consider other organisations as well. By excluding organisations with higher uncertainty from the portfolio, market distortion might occur. Also, the additionality might be more prominent in other parts of the market with more uncertainty [5]. Therefore, some people mention that the choice of the agents should actually be driven by which agent is best able to address the barriers in the market [5,J].

This shows that the principal needs to balance factors like market distortion, additionality and the acceptable level of risk by deciding on which companies to admit to the program. Agents with a limited financing capacity can be helped by more frequent payments, a balanced mix of pre-financing with financing tied to results and tying pay-outs to early-stage results. In the case of a mix of RBF and upfront financing, the amount of upfront financing should be enough to overcome the pre-financing problem. Another way to connect is to market variables like price commitment, per unit subsidy or quantity commitment. Analysis showed that price commitments are valuable when there is demand uncertainty and that quantity commitments are valuable when there is cost uncertainty. These ways might help create an enabling environment, but it is important to research the RBF and see if the RBF can be adapted to these circumstances [5,6,10,12].

Selection Mechanisms

In general, agents apply to the program and some will be admitted and some not. Some programs admit all agents that fit into the restrictions. Others have ranking criteria that rank the organisations

based on a bidding mechanism or other indicators. Only a limited number of companies are in the end admitted. These will be the companies highest in the ranking [I]. A bidding mechanism is frequently used within RBF mechanisms [H,K]. A bidding mechanism is an economic mechanism which purpose it is to set prices by making a bid, for example, on the amount of the subsidy per technology sold. In this case, the agent itself gives an indication of the level of the subsidy that is needed. The companies can be ranked based on the bids and for example, the lowest bids are included in the program. More elaboration on bidding mechanisms can be found in the next sub-chapter. Other forms of ranking are e.g. the expected impact of the project, the level of difficulty of reaching the target group, the level of environmental, social or technical improvement or the quality of the business plan. Also, a combination of several ranking criteria can be used. In this case, the criteria might be weighted, set together and then ranked [H,L]. One principal explained how this worked in their program: “Based on this application, we have a selection grid. Here the companies get like school grades. For example, [they get grades] for if their distribution plan makes sense or if the people working for the company are actually qualified and if they have the knowledge to work at the sector”. In the end, the grades are summed up, and the companies with the highest scores are admitted to the program [L].

Agents who are part of a ranking mechanism mention that they still prefer to have an initial screening before the first selection round. In the initial screening, the hard restrictions are tested before all the financial numbers, business plans, etc. have to be handed in. These are a lot of work to prepare, and if a lot of companies have to do this while they are not suitable for the program, the time and efforts spent are to no purpose [A].

As mentioned before, it is important to decide upon the criteria, but it is also important what sort of structure is used to select the projects with these criteria. A choice needs to be made if all organisations that adhere to the most prominent criteria are admitted or if it is desirable to rank these organisations and only select a few. This is another consideration when designing an RBF program.

Bidding

A bidding mechanism overcomes specific problems and, therefore, might be a desirable tool. One problem it might solve is the lack of information on the principal's side. In many cases, the agent will have more information on various factors that might determine the appropriate value than the principal. Otherwise, an administrative approach might be necessary, but this might limit the cost-effectiveness of an aid mechanism. Therefore, a bidding mechanism is a desirable tool under these circumstances [10].

Another benefit of a bidding mechanism is that it can decrease high windfall profits. Windfall profits imply that the funds are not delivering as many results as possible. Therefore, windfall profits can decrease the legitimacy of using an RBF. Furthermore, the chance of windfall profits decreases because the lower the bid, the more likely the agent will receive the fund. Therefore, the agent will be more attracted to lower profit margins instead of high windfall profits in order to actually be able to develop this side of its business [10].

There are also disadvantages to bidding mechanisms. A bidding mechanism might lead to overly aggressive bidding. This potentially affects the agent's profitability negatively. The resulting value of the RBF is too low because the agent does not adequately take into account the needed margins in order to win with its bid [1,10].

Another potential threat could be that larger companies come out of the bid the best because they already benefit from cost savings because of their economies of scale. Therefore, large companies

overrule the smaller ones [1]. Furthermore, a bidding mechanism might discourage innovation because there is no additional funding left to innovate or take a risk [10].

A bidding mechanism shows a trade-off between low costs in the short run and the prospect of low costs in the future. The latter is the case because short-term windfall profits can encourage intense competition and innovation, which might drive down costs in the long run. Because a bidding mechanism aims for the lowest costs in the short run, strong competition and innovation might decrease, resulting in higher costs in the long-run [10]. Also, there seems to be a trade-off between bid and impact. The lower the bid, the lower the impact and additionality. Therefore, there should be a balance between bid and impact [10]

Another challenging issue that should be kept in mind is that if there is not a reasonable number of bidders in the bidding, the risk exists that the principal might not receive enough value for its money. In this case, bilateral administrative negotiations are more effective [10].

Each program first needs to decide upon what selection mechanism is used. In the case that a ranking mechanism is used, a bidding mechanism is one of the options and might be considered.

8.5. Verification



Figure 8.6. Factors considered in Chapter 8.5. Verification.

The verification process comprises three important considerations. Most important is the decision on which results will trigger the disbursements, the choice of the frequency of the disbursements, and the tools to be used to verify the results. For these factors, see Figure 8.6.

Triggers

Decisions need to be made upon the triggers for disbursements. To decide upon these triggers, firstly, it is important to get a clear view of the goals which are aimed to be achieved to actually reach the envisioned goals [10,G]. These goals need to be aligned in the RBF mechanism with the triggers upon disbursements [12]. It is crucial that results are measurable because these will be verified. Too few indicators might neglect important areas of focus, while too many indicators increase the costs and the complexity of the data collection. It also distracts the agent from the primary goals [1,5]. Also, the indicators should be objectively measurable and within the agent's control. Therefore, it is more logical to pay for output instead of outcomes or impact and therefore, probably, it is the most practised form of an RBF mechanism [5,6,10,G]. However, these should be in alignment with the impact goals.

Moreover, a choice should be made between quantitative and qualitative results. When mainly quantitative results are verified, there might be less focus on the qualitative goals of the program [7]. In this way, quantitative indicators can result in subjective or inaccurate evaluation, while qualitative indicators might lead to more complexity in the verification process. This is also an important consideration when designing the verification process [9,G].

Also, a choice should be made between the number of indicators and triggers upon disbursement. The more indicators are monitored, the more complex the data collection will be. It also leads to distracting the agent from the main goals. Standardised indicators and approaches might help [1,5]. On the other hand, too much focus on the disbursement results leads to distraction from the other

goals. Therefore, a balance is needed between the representation of goals in the triggers upon disbursement and the program's other goals.

Frequency

When the results are clear, there should be thought of how the verification process will be designed. The frequency is one of these values. A higher frequency of payments can encourage stronger attention to results because the attention is less sporadic. It can also lead to greater accountability because there is more incentive to update principals regularly. Furthermore, it makes the process more inclusive to firms with lower financing capacities because these are more reliant on disbursements. Moreover, there can be substantial time lags between verification and disbursements. Difficulties in the verification phase can cause severe problems for the agents because these might rely heavily on timely disbursements. Especially small agents with lower financial capacities face this problem [1,6,G]. A higher frequency of disbursements might already help. Nevertheless, in most cases, higher frequencies of verification have a downside: higher costs. Verification in RBF requires more effort and leads to substantial additional costs. The more frequent verification is needed, the higher the costs and efforts [1,4,5,12,G,H,J]. It is important to make sure the verification costs are in proportion to the value-added, and therefore a balance should be found between frequency and costs [5]. To mitigate this problem, it could be an option to make the height of the subsidy depend on the number of verifications asked for by the agent [6].

If the lag between verification and funding is not communicated clearly to the agent, this can have negative consequences. Therefore it is important to communicate clearly about the timespan. This helps the agent to be able to make long-term strategies [9].

Verification Tools

Thirdly, several tools can be chosen to verify the results. Choosing the right tool or mix of tools requires knowledge of the circumstances and trade-offs of the methods [5,G]. Tools that can be used to verify which results are reached are data collected by the agents and surveys, phone verification and home visits by the verification agent [5]. The first one, data collection by the agents, comprises the lowest costs but is most vulnerable to corruption, while home visits are the most expensive with the highest reliability. A mix of these verification tools is used to bring down costs but still ensure higher reliability in most programs [G]. Also, the emergence of better and more reliable remote and digitalised SHS and CCS in the form of smart technologies can help bring down verification costs [1,11].

The verification methods must be understood by all parties [1,G]. Another important consideration is what happens when agents do not meet the set targets or the verification process shows inconsistencies. There might be a percentage disbursed of the original disbursement or no disbursement at all. However, this might have consequences for the agents. Therefore, this is a delicate matter which should be carefully considered [G].

8.6. Chapter Conclusion

This section aimed to present the results for the fourth and last sub-question: “*What important considerations need to be decided upon with respect to the **design** of results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS)?*”. Analysis of the literature and interviews resulted in a list of multiple considerations. These considerations were divided into five sub-sets of considerations: finance, technology, time, selection and verification.

In the finance sub-chapter, four important considerations are discussed: the price setting, the ticket size, the option of a mix with upfront financing, and the verification costs. For the price setting, the amounts of funds per unit of result need to be decided. Only a correct payment design can support a

good working RBF mechanism. Secondly, the ticket size needs consideration. The ticket size is the minimal and maximal amount of funding per organisation. Thirdly, a mix of RBF with upfront financing might be desirable in some instances. This is another decision that needs to be made. Lastly, which is different from other mechanisms is the significant expense of the verification costs. Therefore, also these are discussed more extensively.

In the sub-chapter about technology, four considerations come forward. First, there needs to be decided upon the type of technology. This report considers two technologies: solar home systems and clean cooking stoves. It is considered which of these is included in the program, one of them or both. Also, other technologies can be added, like mini-grids. These technologies have to adhere to specific quality standards, which is also the next consideration. The quality needs to align with the goals set but cannot be too high if one wants to include more end-users. Furthermore, the admission of innovative projects is a consideration. RBF might reduce the appetite for innovation because of higher risks for non-disbursement, but at the same time, innovation might be desirable in the light of the goals of a principal. Lastly, the offer of technical assistance is considered. A choice must be made if TA is given to the agents and if TA of the agent to the end-users is required to be admitted to the program.

In the third sub-chapter, the central topic is time. In this category, the timespan, the possibility of checkpoints and the sustainability of a program are considerations. The timespan is essential because a too short timespan might not provide enough time to develop a project and have a substantial effect, while a long time span might be too costly, inflexible for change and/or undesirable for donors. Moreover, it is preferable to consider the sustainability of a program already in the design stage. There should be thought about what happens to the projects when a program ends. There are options to ensure better sustainability that can be included in the design of the RBF program. Lastly, checkpoints might be added to avoid unnecessary disruptions, increase sustainability and ensure the inclusion of more agents. This is the last time consideration.

The fourth sub-section, about selection, presents four considerations. Consideration one is about restrictions for organisations to participate in an RBF program. Examples of restrictions are the number of years an organisation exists and does business in the energy sector, the focus area and/or the target group. The type of organisation might also be part of the selection and is discussed more extensively. Another crucial part of the selection is the mechanism that is used. Several ways of selection of the agents are discussed. One selection mechanism is the bidding mechanism, a frequently used tool. A more in-depth part explained the working of that mechanism and the advantages and disadvantages.

Fifthly and lastly, the verification process needs to be designed. The costs are already discussed in the finance sub-section, but the triggers, frequency, and verification tools still need some consideration. There are multiple triggers that can be chosen to be used in an RBF program. Most frequently, the sale of a CCS or SHS is used as the trigger, but also the amount of hours used is an example of a trigger. Not only the trigger itself but also the amount of triggers is essential to consider. The next consideration, frequency, needs to be considered to decide the number of times an agent can be verified and, therefore, is allowed to receive funds. Higher frequencies offer greater accountability, while lower frequencies might be more cost-efficient. The last consideration is about the verification tools used. Common is to use the data and get a sample, verified by phone and home visits. However, the expectation is that more and more focus will be laid on only data.

While there are numerous considerations, these considerations appear to be the most important. All these considerations together form the set of considerations for designing an RBF mechanism. It is also essential to know that these considerations cannot be considered only separately. However,

some are dependent on each other, and one decision cannot be made without influencing other considerations. The interaction between the considerations is vital for a coherent, stable design.

9. Conclusion

This study looked at the development of RBF by answering two research questions: “*What would be a suitable analytical framework for the analysis of considerations for the development of results-based financing (RBF) programs in the energy sector?*” and “*What do the considerations for the development of a results-based financing (RBF) program in the energy sector mean?*” In the fourth chapter, the first research question was answered. Based on the answer to the first research question, the second research question could be divided into four sets of considerations: the desirability of RBF, the suitability of RBF, the feasibility of RBF and the design of RBF.

Firstly, to answer the research question, it was essential to research the desirability of RBF. This led to the first sub-question: *(1) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) desirable?* The answer to this depends on three main considerations for the desirability specific to RBF: risk, flexibility, and achievement of goals. The difference in these factors resulted in effects in favour and against RBF. To a certain extent, an RBF mechanism can be seen as desirable because of the decrease in risk on the principal's side, the increase in flexibility on the side of the agent and the approach of reaching goals. On the other hand, there is an increase in risk on the agent's side, principals do not always allow the flexibility the mechanism might give and the approach to reach goals also has its disadvantages. Therefore, only a principal can decide upon the desirability of a mechanism of RBF when it considers if the mechanism is in line with what it aims to achieve with a program.

Secondly, the suitability of an RBF mechanism was discussed in the second sub-question: *(2) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) suitable?* Here, four main factors need consideration: market development, additionality, market distortion and context maturity. In market development, the second stage of expanding the market phase and the last stage of vulnerable households appeared to be most suitable. Also, depending on the stage in which the mass market is approached, an RBF can help to accelerate the process but might be less additional. Additionality is also the second important factor for suitability. Only when a program is additional an RBF has an effect that is needed for effective aid. To be additional, an RBF program has to be sufficiently solid, and new or more results need to be enforced. The third factor was market distortion. When an RBF distorts the market mainly negatively, the mechanism might not be suitable. Therefore, the adverse effects need to be admissible to a certain extent and not outweigh the positive effects. And lastly, the context needs a balance in its maturity level. Too developed contexts might not require an RBF, but too undeveloped contexts might not have the suitable capacities. These four factors form the basis when considering suitability. These together give a well-grounded insight into the suitability of an RBF mechanism.

The third sub-question concentrates on the feasibility of an RBF mechanism: *(3) To what extent are results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS) feasible?* For the feasibility, the most prominent stakeholders and their capacities were considered. In general, one or multiple donors, a principal, agents, and end-users are crucial and also the receiving government, verification agent and manufacturer play an essential role. All these stakeholders need to have the right capacities, like institutional, network or financial capacities. Nevertheless, these stakeholders also need to fit together and need to have specific capacities in relation to other stakeholders. When these stakeholders and their capacities are not in place, an RBF is not feasible.

And lastly, when a principal decides an RBF mechanism is desirable, suitable and feasible, the last choice is how to design the RBF mechanism. This is translated in the sub-question: *(4) What essential*

*considerations need to be decided upon concerning the **design** of results-based financing (RBF) programs regarding clean cooking stoves (CCS) and solar home systems (SHS)?* A list of 18 considerations came forward when analysing the literature and interviews. These were divided into the categories finance, technology, time, selection, and verification. In these design considerations, it is not only essential to examine every consideration individually, but the composition of different considerations together is also essential to come to an effective RBF program.

To conclude, all four sub-questions resulted in a set of considerations, and all four sets of considerations are crucial when considering the set-up of an RBF program. These help to shape a solid, well-thought path towards a good RBF program. In this way, the report gave an overview of these considerations and steppingstones on how to make sure an RBF mechanism is desirable, suitable, and feasible and, subsequently, how to design the RBF program.

10. Discussion

This last chapter will reflect on this research paper. First, the analytical framework and the considerations will be discussed. Second, there will be reflected on the methods used. Last, several recommendations for further research are presented.

10.1. Reflection on Results

Two research questions were defined at the beginning of the paper. These were answered in chapter four by providing an analytical framework and in the previous sub-chapter in the conclusion. However, it is important to review the results. This will be done in this sub-section. Lastly, some other points of discussion will be highlighted, which are goal displacement, universality in RBF programs and additionality to the research field.

Analytical framework

First, the analytical framework will be discussed which answered the first research question. A well-structured overview of RBF programs in the energy sector was needed because minimal prior information was available on results-based financing in the energy sector. Also, the limited available information was scattered and diverse, and therefore, hard to put together. Most likely, this is the case because RBF programs are relatively new in this sector. Therefore, a hypothetic analytical framework was proposed consisting of four parts, which represent four sets of considerations that need to be followed in chronological order to develop an RBF program.

The supporting structure for data analysis offered by the analytical framework turned out to be crucial to answering the research question. Retrospectively, the analytical framework was instrumental in achieving many of the research objectives. It helped to reorganize the scattered and varied information into a structured overview of the main considerations. It helped to chronologically understand the steps and the considerations when developing an RBF program. Also, it helped to zoom in on underexposed or overlooked sides of developing such a program. This structured overview was lacking in the field and therefore, the framework appeared to be functional in different ways. This framework was useful to the researcher and the research field, but also for principals who execute an RBF program. For the first, it adds in a methodological way to the research itself. It structured the research into a framework which is used in the report. Furthermore, this framework adds to the academic research field by providing an overview of and insight into the considerations when developing an RBF program. Secondly, the framework provides guidelines for principals. A road map for developing an RBF program was missing. Therefore, this framework communicates the steps and the considerations clearly to the principal. Also, the information that is used for these considerations is structured, and this framework helps principals to make weighted and conscious decisions on this matter. Furthermore, the principal RVO validated the value of the framework and the added value to the development of future RBF programs in an ordered and inclusive way. This shows its utility value. Therefore, the developed analytical framework appeared to be an excellent instrument to better grasp the complexity of RBF and its dimensions and add to the research.

There are a few limitations of the used analytical framework. One is inherent to most analytical frameworks, which is that a representation involves some degree of abstraction. This means that not always all aspects, and in most cases even only the key subjects, are included in the framework. This could mean that considerations that seem less important might be excluded and, therefore, might be neglected when developing an RBF program. This is a point of attention when using the framework. While the aim was to include as many different aspects of developing an RBF program as possible, it is likely that there are considerations that did not come forward in this research. However, these might still be important to certain principles, which makes it essential to stay aware of the possibility of other

considerations. Another limitation is related to the relationships between considerations. The relationships between the sets of considerations are made clear, because these need to be followed in chronological order. However, the relationships between the considerations within a set could receive more attention in the framework. Especially in the set of design considerations, specific considerations might be connected to other considerations. In some cases, the connections are briefly discussed in the chapter, but these could maybe be included explicitly somehow as part of the analytical framework. In this respect, the used framework still represents a suitable framework for this research and offers scope for further development in follow-up research.

Considerations

The results of chapters five to eight were presented in a structured way due to the analytical framework used. Nevertheless, the content of the considerations itself also needs some discussion. The information in the four result chapters about the considerations gave an insight into the most relevant issues involved in each consideration, helped to understand what the consideration comprises, and raised awareness about the advantages and disadvantages of a specific choice. Also, the diverse range of considerations showed the diversity in aspects, important to developing an RBF program. This is essential to keep in mind when developing a program. It is not as straightforward as it sometimes seems to develop a program, and there are many aspects to be considered. This thesis shows its relevance. Also, within the different considerations, important research gaps were filled, which added to the field of research. However, the insights are also useful in the sector itself. According to RVO, by presenting the diversity of considerations and the diversity of arguments for each consideration in a systematic overview, the research is instrumental in helping the principal in this complex process. So also for the considerations accounts that these have an analytical and academic value for the field of research, but also a practical value for the principals.

The considerations themselves faced several limitations. While a general overview of the information at hand was given for every consideration, it does not mean all knowledge could be included in a comprehensive manner. Delving deeper into any specific consideration is only possible to a certain extent due to the limited information available, diversity of considerations and limitations of the research scope, time and resources. Although an attempt was made to achieve an inclusive overview, some information might still be lacking. Furthermore, every program is different and different elements might come forward or be important for different programs. This means the overviews given might be more relevant for some principals, while others would need more additional information about certain aspects that could not be covered in-depth in this research paper. Moreover, it was hard to assign factors of comparative importance to the different considerations. The importance of considerations might depend on the path that is taken. For example, if a decision is made in favour of consideration A, consideration B could be influenced by this decision, and therefore, its importance might be influenced as well. Also, different principals might prefer somewhat different objectives and accordingly attach higher or lower importance to particular considerations. Therefore, it is hard to weigh the importance of a consideration. At the same time, in general, some considerations did come forward in literature and interviews as more critical than others, and the importance of these considerations is highlighted to the extent possible in the results chapters. Overall, the described limitations are essential aspects to keep in mind when interpreting and using the information presented in this paper, but the overall format helped review the different aspects and ultimately helped answer the research question.

Other Points of Discussion

There are three aspects singled out for further discussion, which are goal displacement, universality and additionality to the research field. First, an aspect discussed in the chapter about desirability is

addressed. This aspect was goal displacement. According to the interviewed agents and principals, there did not seem to be much goal displacement among their current RBF projects, because these companies valued the social aspects as well. There was no RBF program needed to value these aspects. So goal displacement is not a threat. However, there is another reason that could be thought of, that might cause RBF leading to even less goal displacement than traditional financing instruments. When looking into the results chain (*see Chapter 2.3.*), RBF influences another part of the results chain compared to traditional forms of pre-financing. These traditional forms disburse at the first link in the chain, which is 'input' and maybe try to control the second link of activities in the results chain. This means that many other links need still to be passed before an impact is reached. This leaves much more opportunity for the dealignment of the goals of the principal and an agent. An RBF steps in at a later stage in the chain. It disburses when a particular outcome or output is reached, and therefore, it aims for the third or fourth link in the results chain. These links are positioned further in the results chain compared to traditional financing and, therefore, lie closer to the impact. Therefore, it could be said that less opportunity is left for this dealignment. So, it could be that RBF might even lead to less goal displacement.

A point of discussion in the chapter about suitability is the extent to which a program can be universal in its design or needs to be context-specific. This is an essential point of discussion because it greatly influences how the results reported in this chapter are perceived. As mentioned in the chapter, some people mention that a universal RBF program is possible. However, all programs researched in this paper did consider the context to a certain extent. While multiple principals did look at a specific context and tailored the RBF program design to the context, others included the context in the assessment criteria of the selection process of appropriate agents. This does show the importance of the context's suitability. Moreover, even if these considerations are not included, suitability might be considered as a broader concept than the suitability to the context of a specific country. Instead of looking at the context in a country, the resemblances of the contexts in different countries form a general frame of reference. This means this general frame is less specific, but also, in these programs, the contexts and their suitability can still be considered. Therefore, the chapter remains essential.

Furthermore, the last point of discussion, which is added, is about the additionality of the research to the research field. Already multiple valuable additions to the research field are mentioned, but the question arises of how these relate to the current available literature. As mentioned before, there was minimal literature available. However, at the start of the research paper, one other important research paper is identified, which attempted to fill the research gap of RBF in the energy sector. This is the research paper of Stritzke et al. about the scaling of RBF mechanisms for clean cooking (Stritzke et al., 2021). There are a few essential differences between the research of Stritzke et al. and this research, which show its differences in additional value to the field of research. Although Stritzke et al. give a good insight into CCS, it does not include other energy technologies like SHS, which is another essential technology to SDG 7 considered in this research. Moreover, compared to Stritzke et al. this research provided insight into a broader range of considerations, structured these considerations in a framework and focussed on developing RBF instead of scaling. Also, while the work of Stritzke et al. mainly focused on lessons for the global scaling of RBF programs, this research makes the translation step of lessons to the implications of these lessons for developing a new RBF mechanism. Therefore, it fills another part of the research gap and goes a step further. However, the lessons identified by Stritzke et al. were crucial to this research to make this next step.

10.2. Reflection on Methodology

This part of the discussion will reflect on the methodology. Firstly, the literature review will be discussed. Secondly, the executed interviews and the mix of the literature review and the interviews

are reviewed. And then, the coding analysis, which is used for the literature review and interviews, is scrutinized.

Literature Review

For the literature review, a limited amount of information was available. Nevertheless, enough information could be retrieved to provide insight into the current knowledge, theories and methods to form a basis for the analytical framework and the research while also showing the gaps in existing research and missing perspectives. Because of the complementation of the literature review with other methods, the identification of these gaps and missing perspectives were almost as important to the rest of the research as the information which was found. However, there were also some limitations. A literature review could have been better if more information about RBF in the energy sector was available. Furthermore, this meant that 'grey' sources were included in the literature review. The problem with such sources is that they are more likely to present one-sided perspectives and biases. These were partly filtered because a mix of academic sources with grey sources was used to avoid too much bias that might emanate, and other methods were used to complement the literature review. However, it is hard to avoid the risk of biases completely. Despite the limitations, in the end the literature review was essential to the research.

Interviews

The next method used was interviewing. The 17 interviews that were conducted appeared to be an appropriate method to gather new data to supplement the available information from the literature review. Because the literature review already identified research gaps, the review helped to give direction to the interviews. In this way, the interviews could very well complement the literature review and increase the usefulness of the analysis. Extending and deepening the knowledge helped to describe each consideration in the report, which provided insight into each consideration, an overview of what the consideration comprises, and ultimately an answer to the research question. Therefore, although the information available was limited in the first instance, the combination of the literature review and interviews worked very well for the research.

It is interesting to compare the information from the literature review and the information from the interviews. In general, there was no major difference between the findings of the literature and the findings of the interviews for confirmation. The interviews mainly confirmed the information from the literature. This is important because this confirmation provides reassurance and validation of the literature review data. However, the main additionality of the interviews was in the new information. Additional data could be retrieved and research gaps could be filled, which provided a more inclusive and complete overview of each consideration. This helped to answer the research question and showed added value to the research. The additional information also showed indirect differences. Some considerations that seemed not very diverse or important in research got much more attention and aspects to it in the interviews. For example, the considerations regarding universality, the different stakeholder capacities, and design aspects came forward as crucial to the considerations during the development of an RBF program, while in the literature review some were only briefly mentioned. This also meant that the different interviewees could elaborate more in-depth on specific topics. This information was crucial for a good overview. For example, in the section about price setting, the literature provided a basis for the subject, but the interviewees were able to elaborate and provide new aspects to the consideration, like the adaption of prices during the program. In this way, the methods of data collection complemented each other very well. The literature study ensured a total overview while the interviews confirmed information, filled up research gaps and provided more in-depth knowledge.

Coding

The last method discussed is the extensive coding analysis used for processing the data. The extensive coding analysis conducted for this study seemed to allow the possibility of structuring the limited information available and adding the new information from the interviews in a thorough overview. In retrospect, this approach allowed indeed for structural and broad analysis of the information. The main limitation was that it is a very time-consuming method. However, especially because there was only limited information available, the coding helped to leave no information behind and make an inclusive overview of the available information. Furthermore, coding appeared to be a structured way of arranging the information, which helped avoid biases. In this way, with the support of the coding analysis, the research provided the structured image of RBF in the energy sector, which was aimed for.

10.3. Recommendations for Further Research

In this last sub-section, recommendations for further research are discussed. Further research on results-based financing in the energy sector is highly recommended. Since this research is an exploratory study of the development of RBF programs in the energy sector, there are plenty of opportunities for further research.

This research report deliberately undertook a broad perspective in order to pinpoint the most important considerations when developing an RBF program because developing a results-based financing program is a complex matter of many considerations of which only limited, scattered information appeared to be available. However, as mentioned before, delving deeper into any specific consideration was only possible to a certain extent due to the diversity of considerations and limitations of the research scope, time and resources. Therefore, a more in-depth analysis of the (sets of) considerations is recommended to get a more in-depth view that the principal might need to make balanced decisions on the recommendations. For example, in the consideration of the risks in Chapter four, the advantages and disadvantages of the shift in risk in RBF are discussed. The most prominent advantages and disadvantages are presented. Nevertheless, a more in-depth analysis could help uncover more advantages and disadvantages that did not come forward immediately and can help balance the advantages and disadvantages to each other. This might offer principals the opportunity to make a more balanced decision. This does not only account for this consideration but for others as well. Furthermore, the same accounts for the sets of considerations. More in-depth analysis of the sets might uncover other considerations that are less prominent, however important to RBF. In this way, the considerations and the sets of considerations form a good starting point for further research.

Another point of the investigation, especially in the set of design considerations, is how these considerations are connected to one another. All considerations together form the set of considerations for developing an RBF mechanism. However, not all of these considerations can be examined without considering other considerations. In this way, some are dependent on others. Therefore, the interaction between the considerations is vital for a coherent, stable design, but at the same time, the interactions between considerations are a complex matter. By constructing sets for the different considerations and in the design set sub-sets of sub-considerations, already, a first step is made to group interrelated considerations together, and in some cases, the relations are also briefly discussed. However, a more in-depth analysis of the relations between these considerations could be interesting for further research.

Furthermore, in further research, it might not only be interesting what is investigated but also who is executing the research. Due to the limited resources available, first-hand (data) information by principals themselves was crucial in the literature. The problem with 'grey' information, such as

reports by consultancy organizations or NGOs, is that it might be biased or pointed in a particular direction. Critical points and challenges might be toned down or even unmentioned, while positive results might be exaggerated, or vice versa. Playing up the positive aspects and downplaying the risks and challenges is done out of diverse motivations, such as principals aiming for a good reputation or challenges in the program possibly daunting (potential) donors. Therefore, research conducted from another vantage point – by researchers and other collectors of data and information – and independent fieldwork add to the quality of evidence based on results-based financing in the energy sector. It can help with the emergence and exposure of certain biases.

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