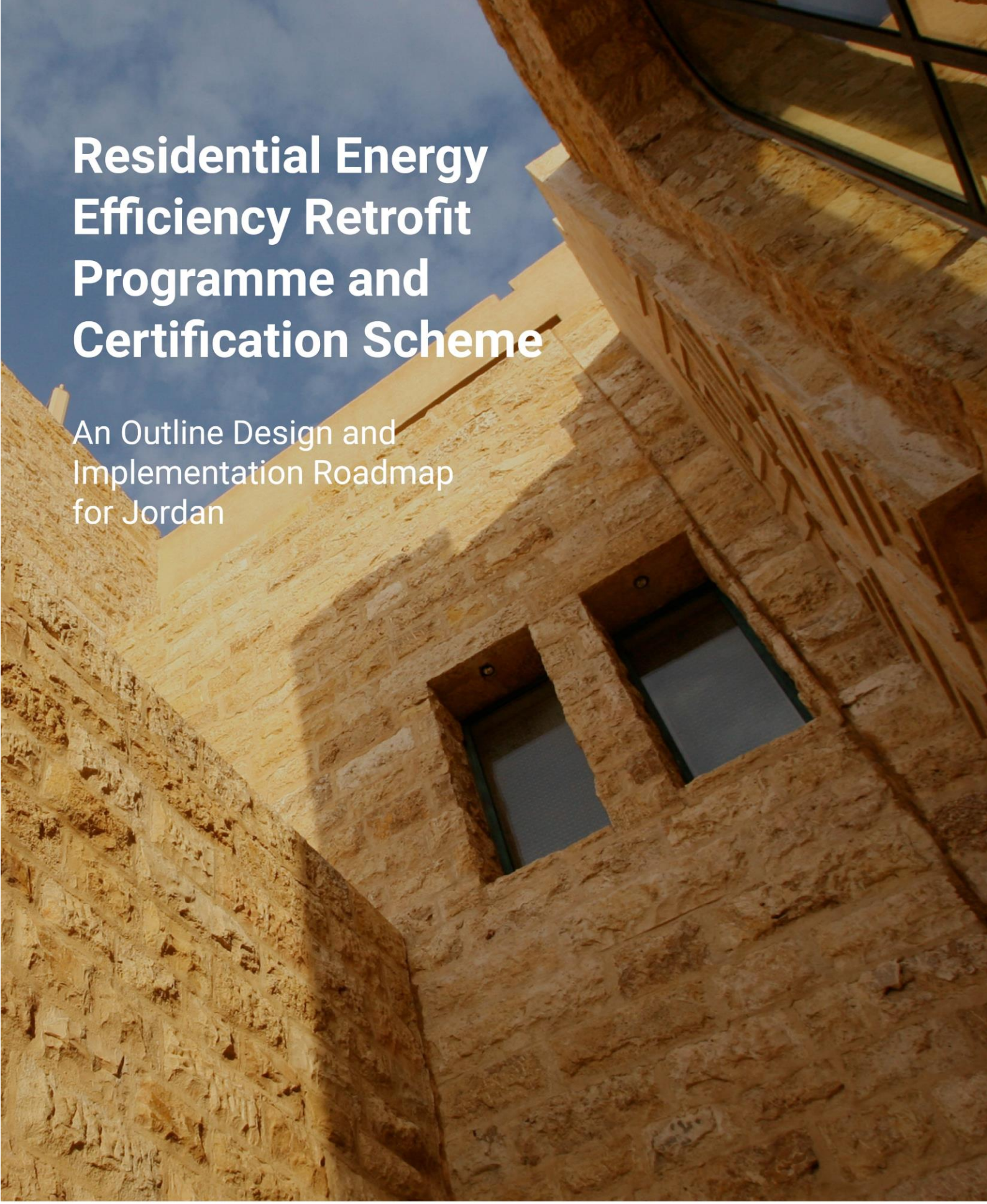

Residential Energy Efficiency Retrofit Programme and Certification Scheme

An Outline Design and Implementation Roadmap for Jordan

Ministry of Energy and Mineral Resources

Ministry of Environment

pmr | Partnership for Market Readiness

World Bank Group

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This work is a product of the staff of The World Bank with external contributions, including from the Partnership for Market Readiness. The Partnership for Market Readiness supports collective innovation and action by providing a platform for countries to share lessons and work together to shape the future of cost effective greenhouse gas mitigation. It also funds capacity building to scale up climate change mitigation efforts.

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Acknowledgements

This report was prepared as part of the Jordan Partnership for Market Readiness initiative. The World Bank team includes, Monali Ranade, Harikumar Gadde, Yazan Tahboub and Haizea Samaniego Fernandez. The main authors of this report, from the Carbon Trust, are Tom Jennings, Daniel Marten, Will Rivers, Charlie McNelly and Marcello Gatti. Local support has been provided by the Jordan Green Building Council, including Ala'a Abdulla, Dr. Ismael Hinti, Ahmad Al-Musa and Hind Hadidi.

The team would like to sincerely thank all the individuals and organisations that contributed their time and expertise during the preparation and completion of this report. Special thanks goes to:

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Eng. Shorouq Abdel Ghani	Ministry of Energy & Mineral Resources
Dr. Rasmi Hamzeh **Eng. Lina Al-Mubaideen** **Eng. Ola Al-Sahran**	Jordanian Renewable Energy & Energy Efficiency Fund
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Dr. Iyad Muslih Al-Sartawi	Jordan Engineers Association
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Cover image

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Table of contents

Table of figures

Abbreviations

Abbreviation	Description
DEC	Display Energy Certificate
EE	Energy Efficiency
EPC	Energy Performance Certificate
EU	European Union
GCF	Green Climate Fund
GHG	Greenhouse Gas
JCCA	Jordan Construction Contractors Association
JEA	Jordan Engineers Association
JGBC	Jordan Green Building Council
JREEEF	Jordan Renewable Energy & Energy Efficiency Fund
MBIs	Market-based Instruments
MEMR	Ministry of Energy and Mineral Resources
MoENV	Ministry of Environment
MPWH	Ministry of Public Works and Housing
MRV	Monitoring, Reporting and Verification
NBC	National Building Council
NEEAP	National Energy Efficiency Action Plan
PMR	Partnership for Market Readiness
WB	World Bank

Executive Summary

This report outlines the design for the Jordan Residential Energy Efficiency Retrofit Programme and Certification Scheme, a market-based instrument with the objective of accelerating a demand-driven market for energy efficiency retrofit in residential buildings in Jordan.

Drivers and rationale for intervention

- The Jordanian residential buildings sector is rapidly growing and dominates electricity use, accounting for 46% of electricity use and 21.5% of Jordan's total share of energy consumption.[1] Reducing this demand is impactful for emissions and eases grid pressure.
- Due to Covid-19 Jordan's economy is due to contract by 3.5% in 2020, and unemployment now sits at 23%. As a labour-intensive activity, energy efficiency is a cost-effective route for job creating economic stimulus, and is being pursued by the UK, French and German Governments.
- Social, health and wellbeing benefits are clear. Energy efficiency improves thermal comfort (especially for low-income households) as well as mental and physical health, and associated financial impacts.

Retrofit programme

The Retrofit Programme will rapidly accelerate the delivery of high-quality residential energy efficiency retrofit. The proposed programme aims to tackle the key barriers identified during stakeholder engagement: awareness of what measures could be installed, trust in supply chain quality and access to upfront capital. Additionally, through the design of the programme a further consideration became apparent: building code compliance.

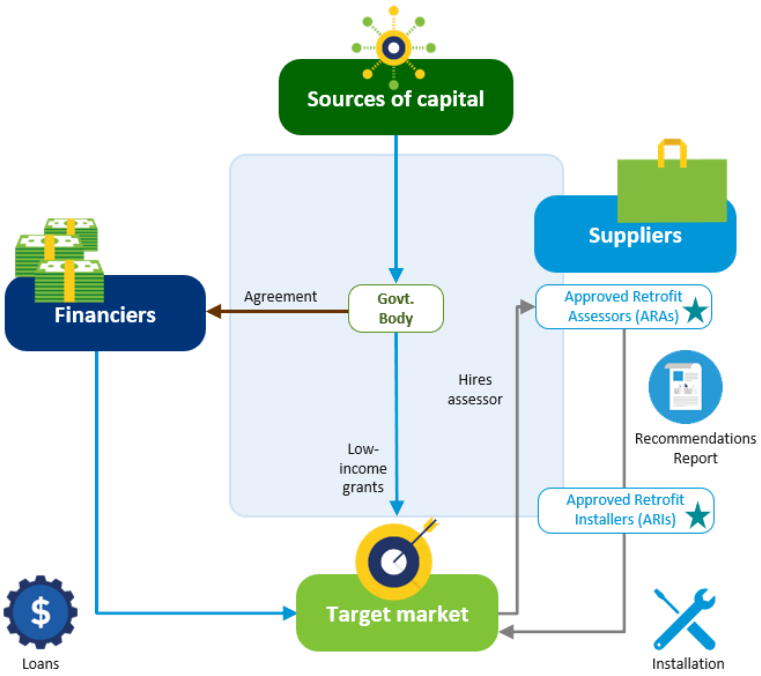


Figure 1: Retrofit Programme Summary

[1] Jordan Green Building Council (2019), 'Developing an Energy Benchmark For Residential Apartments in Amman'. Available from: http://library.fes.de/pdf-files/bueros/amman/15926.pdf

- Assessors, installers and the products they use will require a 'Quality Mark' for the relevant technical body. All three will be hosted on a searchable online database on the scheme website.

- The scheme website is the single touch-point for customers and provides a clear, accessible pathway. This enables the largest number of customers to benefit from the quality supply chain, building trust.

- Different household income groups have different financing needs. *Medium-high income*: cheaper loans from approved banks (who receive credit line). *Low-income*: grant covering up to 90% of total costs.

- Finite pots of donor funding cannot support programmes over long timescales. In order to avoiding a funding 'cliff edge', and the market impacts, identifying a route to self-sufficiency is essential.

Certification scheme

The Certification Scheme is the mechanism by which the Retrofit Programme becomes sustainable, providing it with the longevity required for transformational impact. A certificate is the embodiment of 'energy efficiency done right', bringing together the quality assurance processes of the programme. Certification has four key benefits:

Build Sustainable Markets: Certification creates a long term, self-sustaining, demand-driven market for energy efficiency improvements, reducing dependence on public or donor funding.

Customer Engagement: Certification enables customers to easily identify and understand the value of energy efficiency improvements and energy efficient buildings.

Green Premium: Certification generates a market value for energy efficiency improvements and energy efficient buildings.

Quality Foundation: Provide assurance of quality and impact for investors in to the energy efficiency scheme.

The Retrofit Programme produces a *product* (the certificate), which the customer (household) buys, flowing revenue back into the programme.

- The certification scheme has been designed to be simple, both for customers and administrators. Customers have minimal input into the process, which is run by the Certificate Administrator. The certificate is calculated from evidence submitted digitally by Approved Retrofit Installers using a scoring tool tailored for Jordan.
- The certificate provides two scores: the *building-level score*, which informs a household of the efficiency level of their home and determined the band (A, B, C, etc.), and the *project score*, which shows the efficiency impact of the specific measures they are installing in this project.

- The project score determines the loan interest rate a high-medium income household can secure from an Approved Bank to pay for the measures. The higher the project score, the lower the interest rate.

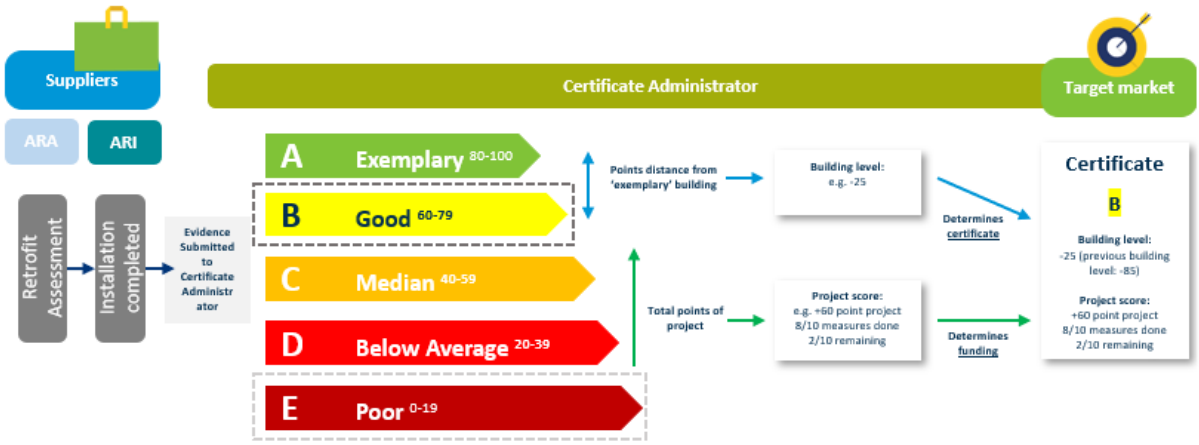


Figure 2: Certification Process Summary

Implementation roadmap

The implementation roadmap sets out a three-stage phased approach, enabling the integration of lessons learnt from a pilot to strength-test the scheme design in real-world context.

The technical scheme design was presented to stakeholders during a joint ministerial session, which included senior representatives from MEMR, JREEEF, MoENV and MPWH. The strategic importance and potential of implementing such a programme in Jordan is recognised, and a 'design finalisation stage' followed by a pilot was proposed. This phasing will ensure the practical considerations for implementing a transformational scheme are strength-tested, and that the correct distribution of roles and responsibilities are agreed, safeguarding the scheme's long-term success.

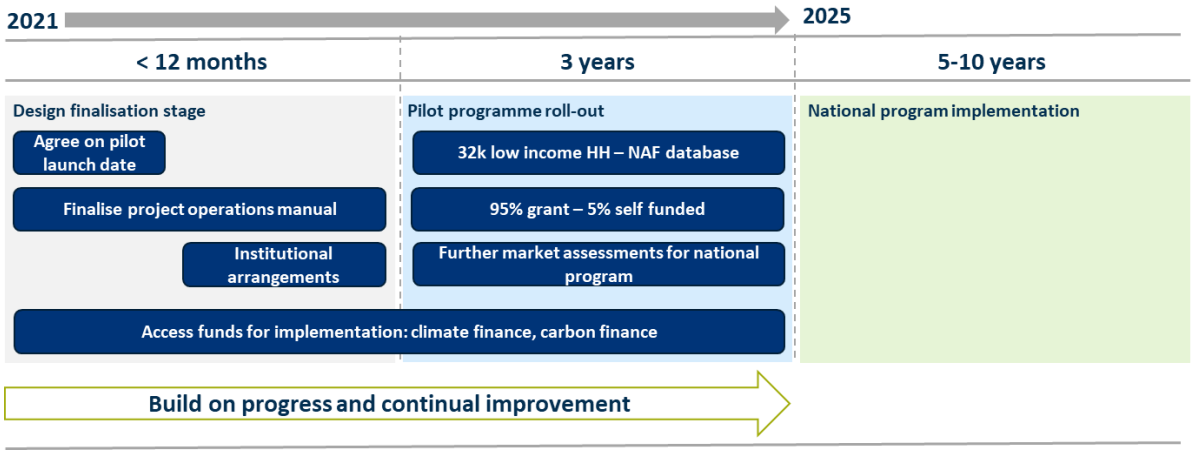


Figure 3: Summary of Implementation Plan

This project has built strong momentum behind the scheme design as it now moves into the design finalisation stage. Intensification of discussions with key stakeholders will be required to address the outstanding questions regarding implementation.

- ❑ The next steps should focus on retaining interest and momentum, and detailing the pilot-stage specifics.

Introduction

This project has been designed to contribute and inform the wider World Bank Partnership for Market Readiness (PMR) programme in Jordan. The overall objective of PMR activities in Jordan, is to assist the Government of Jordan with two key areas:

1. Piloting an integrated Monitoring, Reporting and Verification (MRV) framework in targeted sectors; and
2. Developing the technical capacity of public and private sector stakeholders for identification of a potential market-based instruments (MBIs) for greenhouse gas (GHG) mitigation.

This project falls under the second key area, and amongst the previously prioritised GHG mitigation sectors is residential energy efficiency.

On a global scale, the buildings and buildings construction sectors combined are responsible for over one-third of global final energy consumption and nearly 40% of total direct and indirect CO_2 emissions[2], a pattern which is mirrored in Jordan. In recognition to this challenge, and long-term risk to electricity sector stability, The Jordan Ministry of Energy and Mineral Resources (MEMR) has recognised Energy Efficiency (EE) as a positive action to engage consumers and enable future efforts towards tariff rationalization and reducing cross-subsidies while reducing peak demand.

To this end, the country has already accomplished key policy and governance advances. The Jordan Renewable Energy & Energy Efficiency Fund (JREEEF) was established in 2010 and mandated to lead all energy efficiency activities on MEMR behalf. In addition, the country has established a set of laws, national plans strategies and policies to guide the country towards a more energy efficient future. The National Energy Efficiency Action Plan (NEEAP) summarizes all the national efforts that are taking place in Jordan and sets the road map to be followed by the country towards reaching its EE objectives. The National Energy Strategy (2007-2020)[3] aims to reach the target of 20% improvement in energy efficiency by the year 2020. Beyond this, Jordan's National Energy Strategy 2020-2030 (launched July 2020) sets a target of 9% improvement in energy efficiency by 2030 against 2018 levels.[4]

However, international experience confirms that market-based instruments have a high-potential to complement the uptake of energy efficiency initiatives in this sector (without requiring large additional capital investment from government), and therefore WB PMR laid out the objective to identify market instruments based on global experience that could be adapted for the Jordanian residential context.

To support this effort, the Carbon Trust was selected to lead the design of a retrofit and certification scheme. The Carbon Trust has been a leading voice on building energy efficiency for almost 20 years, with experience designing, implementing and monitoring EE programmes around the world. Most specifically to Jordan, the Carbon Trust delivered a previous consultation on behalf of the World Bank in 2019 which extracted learnings from the UK's flagship domestic EE programme 'The UK Green Deal'

[2] International Energy Agency - IEA (2019), 'Energy Efficiency 2019'. Available from: https://webstore.iea.org/download/direct/2891

[3] The Jordan Ministry of Energy and Mineral Resources – MEMR, 'Summary of the Updated Master Strategy of Energy Sector in Jordan for the period (2007-2020)'. Available from: http://www.memr.gov.jo/EBV4.0/Root_Storage/EN/EB_Info_Page/energystrategy.pdf

[4] The Jordan Times (2020), 'Energy Strategy 2020-2030'. Available from: https://www.jordantimes.com/opinion/ayoub-abu-dayyeh/energy-strategy-2020-%E2%80%94%C2%A02030

and transposed these to Jordan's domestic EE setting[5]. JGBC was selected by Carbon Trust to support by providing local legal and policy framework knowledge, as well as enabling stakeholder engagement.

The key objective of the assignment was to take learnings from previous work, international experience and best practice to develop a proposal for a Jordan Residential Energy Efficiency Retrofit and Building Certification Scheme. The consortium collaborated closely with the WB PMR Jordan team to deliver this project. The project was delivered from June – October 2020, as described in the figure below:

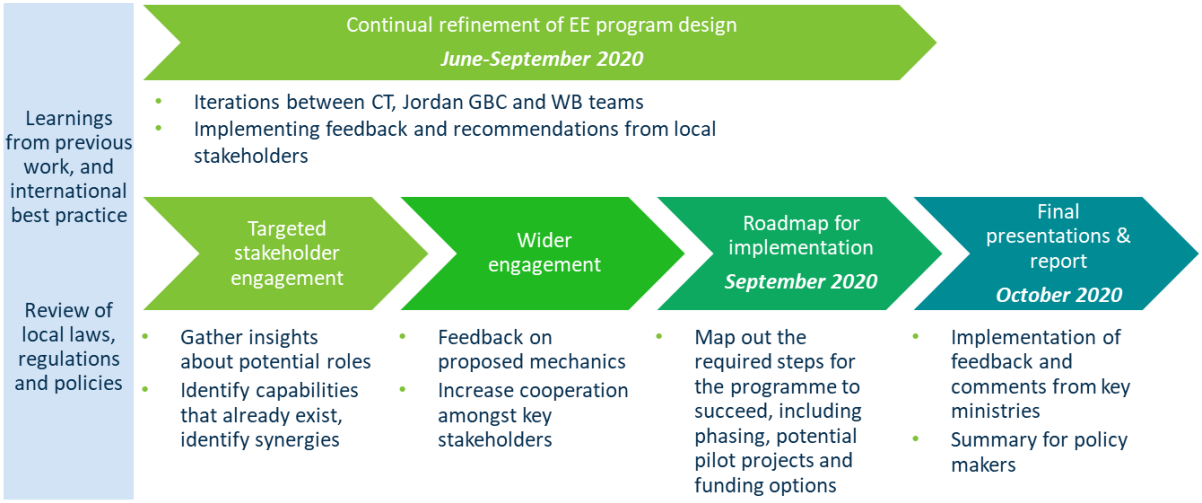


Figure 4: Project Methodology and Design Timeframes

Two key elements underpin this project's methodology:

- The first is a robust baseline of knowledge, gathered from the consultant's experience and additional desk-based research, which guaranteed the most relevant examples of international best practice were considered, and the most recent local regulation and policies were understood.
- Secondly, the methodology incorporated a continual stakeholder engagement strategy to allow a gradual refinement of the design, and to gain key stakeholder buy-in throughout the process. Ideally, this would have allowed via in-person roundtables and stakeholder engagement sessions in Amman, however due to Covid-19 travel restrictions these were replaced with the digital kind. Throughout the project, more than ten different stakeholders were contacted, and three high-level ministerial sessions were hosted to gather feedback.

This report represents the final output of the project. The first section focuses on the rationale justifying a market-based mechanism focusing on domestic EE as a key vehicle to achieve economic stimulus, along with strong social, energy and climate co-benefits. The 'Retrofit & Certification Scheme Design' section describes the technical implementation details from the scheme, detailing how such a programme could viably be executed in Jordan. Recognising the scale and ambition of such a vision, the third section outlines an implementation roadmap, which describes the key next steps and timelines for implementation. The appendices section gathers the collection of desk-based research and other insight gathered throughout the process.

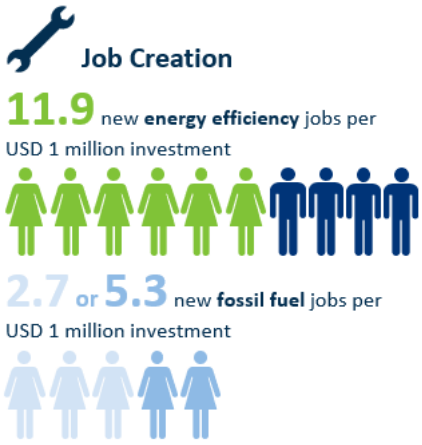
[5] The Carbon Trust (2019), 'The UK Green Deal: Summary of findings from the UK Green Deal analysis and domestic energy efficiency consultation in Jordan'.

Rationale for Intervention

Large-scale residential energy efficiency retrofit programmes are high-impact macro-responsive economic stimulus, driving both employment and capital spending flows at national scales, whilst offering significant social and environmental co-benefits.

The Covid-19 pandemic is delivering a dual global health and economic crisis. In order to contain viral spread governments have been forced to adopt restrictive measures for their populations, resulting in mass business disruption and a growing wave of global unemployment. This impact is already visible in Jordan, where the economy is projected to contract by 3.5% in 2020, the first contraction in decades.[6] The impact will also likely be further amplified by Jordan's economy already being in a low-growth and high youth unemployment cycle; the unemployment rate now sits at 23% for the second quarter of 2020.[7] Given this grave economic situation, governments around the globe are looking to provide stimulus to rebuild economies as quickly as possible. With the UK having recently led the way in announcing a £3bn energy efficiency stimulus package, it is increasingly being recognised that energy efficiency highly cost-effective stimulus route. It provides labour-intensive projects with short lead-times that are rooted in local supply chains such as construction and manufacturing.[8]

There are three main ways a large-scale energy efficiency programme stimulates the economy:



- **Job creation:** energy efficiency is a labour-intensive economic activity. Krarti and Dubey examined the productivity impact of a 'basic programme' in Oman, and concluded 11.9 new jobs per USD 1 million spent.[9] This included 7 direct jobs, in the auditing of buildings and installation of measures, and 4.9 indirect jobs in the production of measures. By comparison, fossil fuel investment has been shown to produce only around 2.7-5.3 new jobs per USD 1 million spent.[10] It is worth noting that these figures are not from the same study, and that the fossil fuel figures are from developed economies. However, even accounting for this the cost-effective job creation potential of energy efficiency is clear.
- **Additional Disposable Income:** by saving households money on bills, energy efficiency frees up disposable income. This can be used to buy goods and services in the economy, and has knock-on positive effects.

[6] The World Bank (2020), 'Jordan: COVID-19 Pandemic Weighs Heavily on the Economy, as it does on the Region'. Available from: https://www.worldbank.org/en/news/press-release/2020/07/14/jordan-covid-19-pandemic-weighs-heavily-on-the-economy-as-it-does-on-the-region?cid=SHR_SitesShareTT_EN_EXT

[7] Available from: https://tradingeconomics.com/jordan/unemployment-rate

[8] Available from: https://www.iea.org/articles/energy-efficiency-and-economic-stimulus

[9] Krarti & Dubey (2017), 'Energy productivity evaluation of large-scale building energy efficiency programs for Oman'. Available from: https://www.sciencedirect.com/science/article/abs/pii/S221067071630628X?via%3Dihub

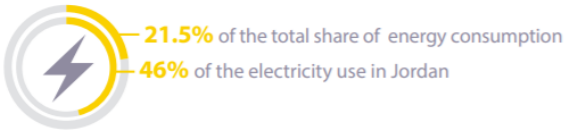
[10] Pollin, Peltier & Wicks-Lim (2009), 'Green Prosperity: How Clean-Energy Policies Can Fight Poverty and Raise Living Standards in the United States'. Available from: https://www.researchgate.net/publication/254455279_Green_Prosperity_How_Clean-Energy_Policies_Can_Fight_Poverty_and_Raise_Living_Standards_in_the_United_States; and Garrett-Peltier (2017), 'Green versus brown: Comparing the employment impacts of energy efficiency, renewable energy, and fossil fuels using an input-output model'. Available from: https://www.sciencedirect.com/science/article/abs/pii/S026499931630709X?via%3Dihub

- **Avoided government investment:** by reducing energy demand, the requirement for Government to build expensive new generation capacity is reduced. A 'basic' programme in Oman was estimated to reduce peak energy demand by 214 MW.[11] The Al Kamil Power Plant (OCGT) in Oman has a generating capacity of 276 MW and cost USD 200m to build, therefore it is evident this represents significant potential capital saving for the government.[12]

The potential economic stimulus effects outlined above are not in isolation. Energy efficiency has a 'ripple' 'radial' effect, activating the numerous other sectors it overlaps with. The economic stimulus delivered through an energy efficiency programme will drive knock-on economic uplift across construction, engineering, building services, energy manufacturing and logistics. Alongside this, an energy efficiency programme offers strong co-benefits beyond just creating jobs and value:

- **Improving the thermal comfort of homes has measurable physical and mental health benefits**: This in turn improves physical health (e.g. respiratory and cardiovascular conditions) and mental health (the financial stress of coping with high energy bills and debt). A cost-benefit analysis of a retrofit scheme in New Zealand found 75% of low-income households' financial benefits from the scheme were health-related (i.e. reduced days off work, care costs, etc.).[13]
- **Improving the building fabric creates higher-quality properties,** which could benefit from higher property values.
- **Energy efficiency reduces the carbon emissions generated by the residential sector.**

It's also worth mentioning a broad, macro-impact. **Reducing energy consumption strengthens grid resilience** by reducing peak demand**.** Residential subsidies are expensive for the government and are undermining the financial sustainability of the grid. They are also suffocating industry (who pay higher energy tariffs). Reducing residential consumption is the first step to 'tariff rationalisation'.



Jordan is a highly urbanised country, with 42% of the population concentrated in the capital city, Amman, and 80% of the population classified as 'urban population'. The residential sector currently accounts for 21.5% of total energy consumption, rising to 46% of total electricity use.[14] This consumption sits within the context of the expansion of the built environment in Jordan, of which residential building dominate. However, despite electricity tariffs increasing by 5-15% in recent years, the residential energy efficiency retrofit market in Jordan is minimal.

In order to rapidly accelerate the development of this market, overcoming the existing barriers hindering activity to capture the broad benefits discussed above, a comprehensive programme is required to: (i) **assure quality and build trust in the supply chain**, (ii) **simplify the process for consumers** and (iii) **support financing**. Attached to this programme, a certification scheme is required to transform a donor or public-funded programme into a self-sustaining market. A market which can continue to create new jobs and improve the Jordanian housing stock without significant additional government investment.

[11] Krarti & Dubey (2017), 'Energy productivity evaluation of large-scale building energy efficiency programs for Oman'. Available from: https://www.sciencedirect.com/science/article/abs/pii/S221067071630628X?via%3Dihub
[12] Available from: http://www.globalenergyobservatory.org/geoid/2016; and https://gulfnews.com/uae/financing-completed-for-omans-al-kamil-power-project-1.413305
[13] IEA (2019), 'Multiple Benefits of Energy Efficiency – Health and Wellbeing'. Available from: https://www.iea.org/reports/multiple-benefits-of-energy-efficiency/health-and-wellbeing
[14] Jordan Green Building Council (2019), 'Developing an Energy Benchmark For Residential Apartments in Amman'. Available from: http://library.fes.de/pdf-files/bueros/amman/15926.pdf

Retrofit Programme & Certification Scheme Design

EE Retrofit and certification schemes have been designed and implemented around the world, and vary greatly in terms of structure, reach and complexity. Lessons from the evaluation of the design process behind the UK Green Deal draw attention to the importance of setting out clear, achievable and measurable objectives from the project outset.[15]

The use of the terminology 'programme' and 'scheme' has distinct and specific meaning throughout this section:

- **Programme:** Refers to the 'Retrofit Programme'. This is the supply-chain building, finance providing support structure, aiming to boost the number of building retrofits occurring.
- **Scheme:** Refers to the 'Certification Scheme'. This is the longer-term mechanism, creating a sustainable market for energy efficiency retrofit. The overall combined programme-scheme is also called the scheme, for example 'scheme website'.

To help ensure the success of this programme, a vision of the programme objectives and design 'must-haves' were established by the project and WB teams to set clear guidelines for ensuring the final design is practical and effective in the Jordanian context. For additional commentary on the design and design-drivers, see Annex A – JREEEF Review Report.

Design 'must haves'

Design must motivate:

Action

Implementation

Outcomes

Reward

The design of a practical scheme must not only consider the potential impact present in Jordan, but also it's limitations. To this end, key design 'must haves' were identified as elements which are considered essencial to the success of the project, as follows:

Incentivises action: the programme needs to encourage building owners to take action on their own building, without the need of enforcement. A personalised model where focus is placed on individual motivation and certification for improvements, and provides as clear outcomes a comparison of the building against itself over time, via 'baseline' set at outset.

Minimal burden to government: it is essential that the proposed programme is accepted and backed by the government, but must move away from a top down policy/enforcement approach (which is considered impractical and costly), and move towards a bottom-up model driven by demand and individual benefits.

Maximise the role of other actors (mainly private): as this is a market-based instrument, private players will start to see the economic opportunities in participating, which will shift the burden of effort/costs to them and ultimately drive a self-sufficient market.

[15] The Carbon Trust (2019), 'The UK Green Deal: Summary of findings from the UK Green Deal analysis and domestic energy efficiency consultation in Jordan'.

Low operational costs: building up on the previous two points, a key priority is to design an agile and effective implementation structure, so that inevitable costs (costs relating to site visits, audits, modelling of energy savings, issuing of certificates, etc.) are kept at a minimum.

Simple: a key priority for the design of the scheme is to keep a customer focus. The target market must be able to easily understand and interpret (technical documents for a non-technical audience), and the costumer journey should be streamlined to guarantee higher participation and low drop-off rates.

Quantifiable: needs to be able to provide a level of quantification on what the deemed or estimated be it energy, cost or carbon savings are, while still having a simple and streamlined programme. Being able to quantify this is essential to meet the broader design objectives mentioned above (e.g. potentially access climate financing).

Staged incentives: Provide financial incentives proportional to the potential impact (linked with depth of actions taken), and allow the target market to be able to participate in the programme multiple times.

Retrofit Programme

This retrofit programme builds directly on the key measures for the residential sector laid out by the Jordanian Government in the National Energy Efficiency Action Plan (NEEAP) of 2013.[16] These measures were:

- 2.1.1.1 – **Replacement of 1.5 million incandescent lamps with energy efficient lamps (CFL)**
- 2.1.1.2 – **Energy Label programme for four home appliances**
- 2.1.1.3 – **Installation of 30,000 Solar water heaters**
- 2.1.1.4 – **Survey of energy consumption in Residential sector by the end of 2012**
- 2.1.1.5 – **Installation of 5,162 Solar water heaters**

The retrofit programme will contribute to the further achievement of these objectives, as well as driving forwards to a more ambitious and holistic energy efficiency intervention for the residential sector. This is in tune with current Jordanian Government thinking, where an energy efficiency programme targeted at the large residential sector has been gaining momentum.

[16] MED-ENEC (2013), 'National Energy Efficiency Action Plan'. Available from: https://www.rcreee.org/sites/default/files/plans_neeap_jordan_2013_en.pdf

The Carbon Trust's approach to energy efficiency programmes is underpinned by a thorough review of international best practice through the *'Available, Attractive, Too Slow?'* report.[17] This research spanned programmes in UK, USA, Turkey, China, Thailand, India, Brazil and Mexico, as well as regional efforts, to establish the key building blocks of successful energy efficiency programmes.

The best practice approach identified was to structure the design by the key market 'players': suppliers, target market (customers), financiers, and sources of capital (donors or investors).

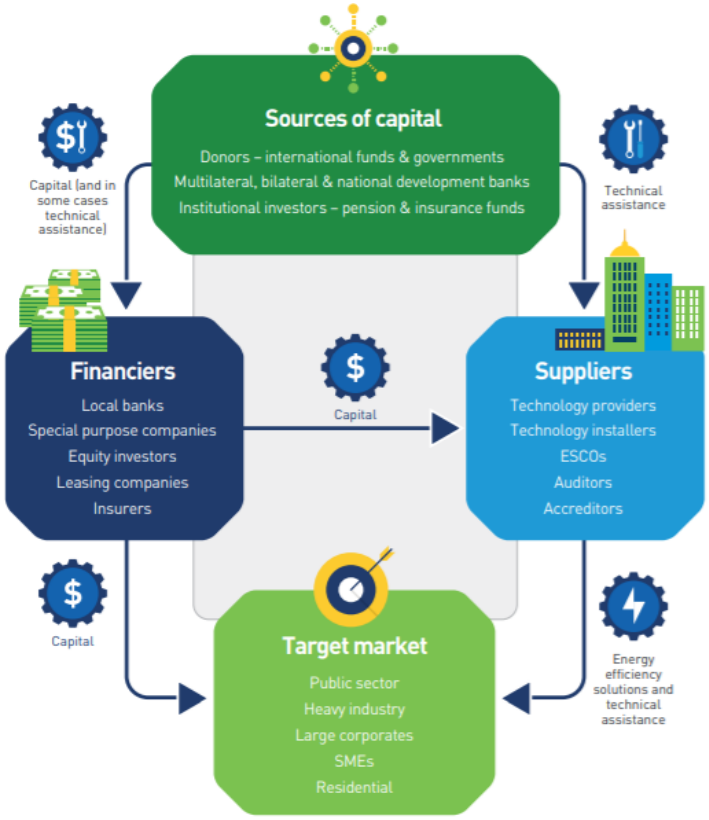


Figure 5: Key Players in an Energy Efficiency Programme

In designing the Jordanian Residential Energy Efficiency Retrofit Programme, we have followed this structured approach, starting with the quality and trust framework for the **suppliers**, then a simple, structured process for the **target market** to access this supply chain, and then how tailored **finance** can be offered for low income and medium-high income households. Finally, our assessment of **sources of capital**, particularly within the context of long-term transformational programme impact, led us to consider how we can attach a self-sustaining market mechanism, to safeguard capital provision for the retrofit programme. We determined this could be done through a certification scheme.

Defining the core components

The starting point for the design of the retrofit programme is to identify the core components that, based on our review of international best practice, underpin a successful programme. Each component is a 'building block' of the wider retrofit programme, and clearly defining them establishes a shared terminology for the programme. Tables 1 and 2, which cover the components and roles respectively, are included here for references purposes. Whilst reviewing the programme design, it is recommended that each of the components and roles mentioned are checked against these two tables, in order to cement their precise definition. The reason for this structuring is to position the report as a practical guide for continued referral.

[17] The Carbon Trust (2017), 'Available, attractive, too slow? How to accelerate energy efficiency by getting the financing for it right'. Available from: https://www.carbontrust.com/resources/available-attractive-too-slow-how-to-accelerate-energy-efficiency-by-getting-the

Table 1: Summary of Programme Components

Programme Component	Description
Approved Product List	• All products approved for use under the scheme. May be a combination of categories of product and specific products authorised for inclusion. • Product standards are set by a Product Standards Body with responsibility for setting the criteria for products that can be included. This may involve utilising existing product standards in the market place or defining new criteria where necessary for the success of the scheme. • The Approved Product List is made publicly accessible and kept up to date by the Scheme Administrator
Approved Experts List	• All contractors, engineers or other companies accredited as Approved Retrofit Assessors or Approved Retrofit Installers will be recorded in a central list, ideally in the form of a searchable web database. • The list should include details of the retrofit products and services that the installer is approved for. • The list should be kept up to date by a combination of the Scheme Administrator and the Training and Certification Providers.
Quality Mark	• A publicly recognisable accreditation mark provided to Retrofit Assessors and Retrofit Installers who are accredited under the Scheme. • Business accredited under the scheme have demonstrated their technical competence to install measures to high standards and are committed to following a Consumer Code of Conduct and Customer Redress Process. • These elements drive trust in businesses carrying the Quality Mark, helping to build the market for retrofit.
Scheme Website	• Central touch-point of programme, managed by the Administrative Body. Host the Approved Product List, Approved Experts List, Certificate Database and other useful information and resources.
Consumer Code of Conduct	• Approved Retrofit Installers and Retrofit Assessors would ideally agree to minimum requirements for consumer protection relating to their works. A Consumer Code of Conduct is essential for driving good practice and building consumer and investor confidence in the scheme. The Code of Conduct should include: - Details of when and how quotations should be provided in a clear format, detailing all ancillary works and with no hidden fees. - Details of when and how contracts should be drawn up and signed and minimum protections for consumers within contracts. - Details of how the potential benefits and risks associated with any measures are communicated to customers in good faith. - Details of terms of Payment. - Details of guarantees and warranties associated with the work.

	- Cancellation rights. - Timetable of works. - Process for dealing with complaints. - Ensuring competency of sub-contractors.
Approved Building Energy Assessment Methodology	• An approved technical methodology or specification for assessing the current energy use of buildings and their suitability for retrofit measures. The methodology should also provide a consistent basis for the Retrofit Assessment and estimating the costs, savings (energy, fuel bill, CO_2 emissions) of measures in the Recommendations Report. • This is essential to ensuring that the potential benefits and impacts of measures are communicated accurately and consistently between installers and assessors.
Energy Assessment Tools	• A tool for the quick and easy calculation of the Approved Building Energy Assessment Methodology on a building by building basis. Either provided as a central resource or developed independently (following the approved methodology).
Recommendations Report	• Output of retrofit assessment produced by Approved Retrofit Assessors (ARAs). Include both code compliance and energy efficiency measures.
Technical Installation Standards	• Publicly accessible technical standards and guidance that Approved Retrofit Installers should work to when installing measures and undertaking works. • These standards are designed to ensure that measures are installed according to industry best practice methods with sufficient focus on the design and avoidance of common retrofit issues. • Standards to include consideration of the 'whole building approach' and appropriate levels of design to ensure that measures will perform as anticipated in-situ and avoid unintended negative consequences. Includes consideration of relevant risks to the installation of measures and the installation of multiple measures. • Where projects involve more than a single measure, the Technical Installation Standards must address how the interaction of the measures will be appropriately designed and how any increased risks will be mitigated.

Defining roles and responsibilities

Having established some of the core components of the retrofit programme, it is necessary to identify the different roles and players within the programme, and the responsibilities of these players – including how they will interact with different components. The following table defines some of the potential roles and responsibilities necessary to deliver a retrofit and certification scheme, based on our review of international good practice.

Table 2: Summary of Programme Roles & Responsibilities

Programme Role	Responsibility
Government Body	• Oversee and quality assure the administration of the scheme, reporting its impact to the relevant MRV body.
Administrative Body	• The body with administrative responsibility for the scheme, ensures that all Approved Retrofit Assessors (ARAs) and Approved Retrofit Installers (ARIs) have the necessary competence and qualification for works undertaken. • Hosts and administer the scheme website and searchable database of ARAs, ARIs and Approved Retrofit Products.
Engineer Body	• Organisations or other institutions responsible for providing training and certification of competence for ARAs.
Contractor Body	• Organisations or other institutions responsible for providing training and certification of competence for ARIs.
Standards Body	• The organisation responsible for setting and periodically updating the standards for energy efficiency products and equipment to be used in the scheme.
Approved Retrofit Assessors	• Energy engineers with certified competence in assessing domestic buildings for energy efficiency retrofit measures and preparing the Retrofit Assessment and Recommendations Report.
Approved Retrofit Installers	• Builders, energy efficiency installers, renewable energy installers and other contractors responsible for the design and installation of retrofit works in buildings. • Each ARI is approved under the scheme to undertake specific work for which they have demonstrated the requisite competency and qualifications. Approval is contingent on adherence to the Consumer Code of Conduct.
Approved Banks	• Approved by Government Body of programme to provide concessional finance to programme customers in line with agreed energy efficiency project performance.

Retrofit programme design

Suppliers: Supply Chain Trust & Quality Framework

The foundation of a successful retrofit programme is a 'quality framework' that builds customer trust in the supply chain. During our engagement with stakeholders close to the Jordanian energy efficiency supply chain, such as JEA, JCCA and project partners Jordan GBC, it was identified that a key market barrier hindering energy efficiency retrofit is the lack of trust and quality in the current supply chain.

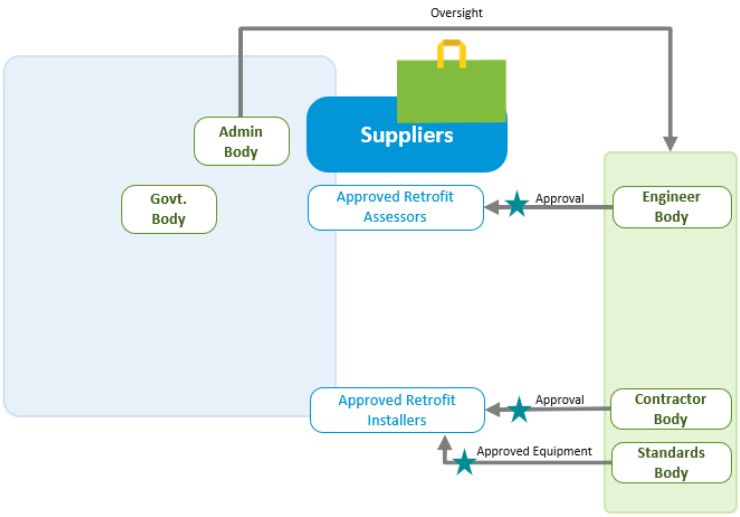


Figure 6: Schematic of Quality Framework

In order to build trust in the supply chain based on a perception of 'guaranteed quality'; ***ARAs***, ***ARIs*** and the equipment or products they use, will require a '***Quality Mark***' from the relevant technical body – either the ***Engineer***, ***Contractor*** or ***Standards Body*** (see Table 1 and 2). The '***Quality Mark***' will be based on required quality criteria, which each technical body will be responsible for setting. It is expected that the 'approvals' will be managed by government bodies or professional associations, as is common practice across EU EPC schemes. ***ARAs*** and ***ARIs*** will sign up to a ***Consumer Code of Conduct***. The broader '**Quality Mark**' framework (shaded green) will be managed by the ***Administrative Body***, which in turn is overseen by the overall ***Government Body***.

The UK Government has successfully implemented a similar approach to the proposed 'Quality Mark' through the **TrustMark**, a government-endorsed third-party quality scheme for contractors. Quality is defined against technical competence, customer service and trading practice. The latest large-scale energy efficiency stimulus from the UK Government, the Green Homes Grant scheme, requires TrustMark contractors be used.

The programme will be accessible and transparent through the use of a website and associated searchable database. The ***Approved Experts List*** will include ***ARAs*** and ***ARIs***, automatically listed on the database upon approval, which prospective customers can search via the ***Scheme Website*** – managed by the ***Administrative Body***. ***ARIs*** can further use this website to search the database for approved equipment and products, through the ***Approved Product List***, for their use in delivering recommended measures. In the UK, the Energy Technology List (ETL) serves a similar function. The ETL covers a wide range of energy efficiency products and technologies, with criteria that increase in stringency year on year, and a linked tax incentive for businesses buying products from the list.

The German Government's **KfW 'Energy-Efficient Refurbishment' programme** utilises a searchable online register. All experts involved in the planning and construction process must be listed. Requirements for listing include: proof of professional experience and quality, re-listing every three years, and ongoing training to keep pace with technical, legal and market developments.

Target Market: Structured Customer Process

In order for the largest number of customers to benefit from the quality framework, and thereby build

The Portuguese **Certificar e Valorizar** scheme uses an online platform with searchable expert and certificate databases. Customers input information regarding energy-use and building type and receive recommendations of retrofit measures and approved local installers. The scheme is managed by ADENE, the Portuguese national energy agency, which is a private non-profit 'public interest institution'. The 'expert search' covers building energy audits or qualified certificate providers, the 'technicians search' covers installation and maintenance contractors.

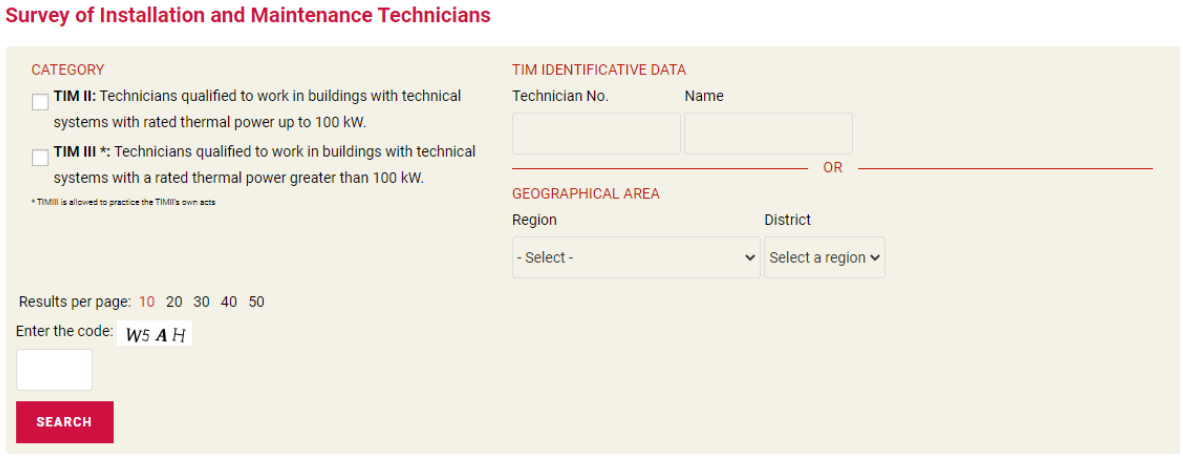


Figure 7: ADENE Installation and Maintenance Technicians Database Search

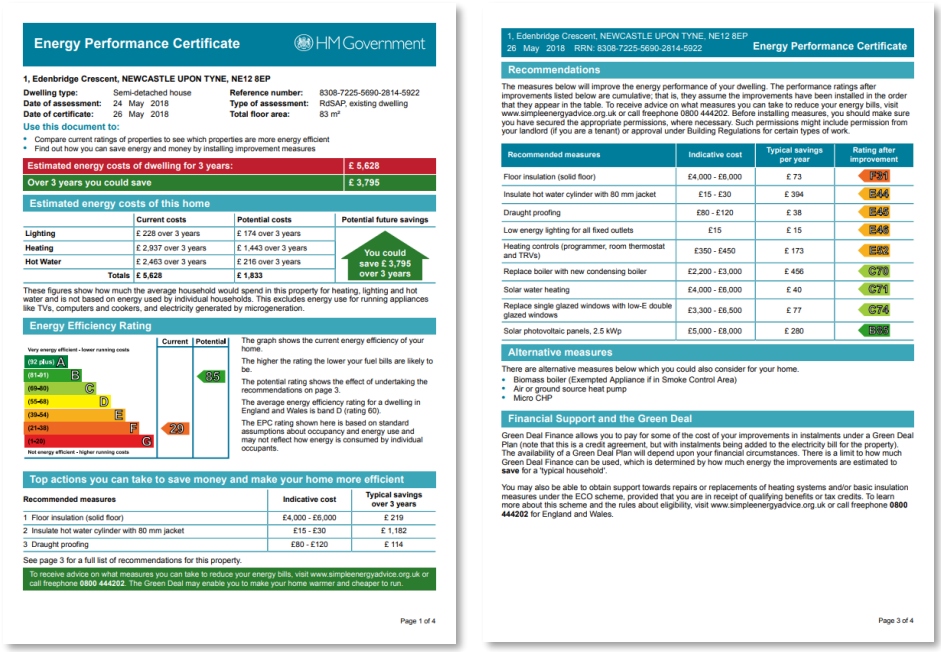
Figure 8: ADENE Experts Database Search

trust most quickly, the route to accessing services must be clear and simple. The programme will provide a centralised and accessible pathway for customers to move through the retrofit process, benefiting from the quality framework at each step. The centralisation of the process is facilitated by the use of the ***Scheme Website*** and database, which brings all the steps under one roof and provides a single 'touch point' for customers.

Once a customer is made aware of the programme they can visit the ***Scheme Website***, and use the ***Approved Experts List*** in order to search for and hire an ***ARA*** that is geographically local and fits their needs. There is also an option to input initial building and energy-use information at this stage, which the hired ***ARA*** can review and confirm. Figure 6 and 7 show the scheme database in Portugal, which illustrates what a simple version could look like.

The ***ARA*** will complete a retrofit assessment, using customer-submitted data and a site-visit if required following the ***Approved Building Energy Assessment Methodology*** and using the correct ***Energy Assessment Tools***, to produce a ***Recommendations Report*** for the customer using the programme template. The assessment and report cost will be covered (up to 90%) for low-income households. For medium-high income households, it is hoped that ***ARAs*** also providing ***ARI*** services will offer the retrofit assessment free-of-charge if customers progress to installation. There is also an option to provide 'holiday periods' during which the programme covers a proportion of all retrofit assessment costs, in order to drive uptake. The ***Recommendations Report*** contains two key elements:

- **Code Compliance Measures:** What improvements to the residential building are required, in order for it to be compliant with the National Building Codes. Code compliance is a pre-requisite for retrofit measures, however can be included within the same project of improvements up to a value of 40% of the total cost.
- **Retrofit Measures:** Based on the Retrofit Assessment, which energy efficiency improvements are recommended for the building in order to most significantly impact thermal comfort and energy usage.



Energy Performance Certificate — HM Government

1, Edenbridge Crescent, NEWCASTLE UPON TYNE, NE12 8EP

Dwelling type:	Semi-detached house	**Reference number:**	8308-7225-5690-2814-5922
Date of assessment:	24 May 2018	**Type of assessment:**	RdSAP, existing dwelling
Date of certificate:	26 May 2018	**Total floor area:**	83 m²

Use this document to:

- Compare current ratings of properties to see which properties are more energy efficient
- Find out how you can save energy and money by installing improvement measures

Estimated energy costs of dwelling for 3 years:	**£ 5,628**
Over 3 years you could save	**£ 3,795**

Estimated energy costs of this home

	Current costs	Potential costs	Potential future savings
Lighting	£ 228 over 3 years	£ 174 over 3 years	You could save £ 3,795 over 3 years
Heating	£ 2,937 over 3 years	£ 1,443 over 3 years	
Hot Water	£ 2,463 over 3 years	£ 216 over 3 years	
Totals	**£ 5,628**	**£ 1,833**	

These figures show how much the average household would spend in this property for heating, lighting and hot water and is not based on energy used by individual households. This excludes energy use for running appliances like TVs, computers and cookers, and electricity generated by microgeneration.

Energy Efficiency Rating

	Current	Potential
Very energy efficient - lower running costs		
(92 plus) A		
(81-91) B		86
(69-80) C		
(55-68) D		
(39-54) E		
(21-38) F	29	
(1-20) G		
Not energy efficient - higher running costs		

The graph shows the current energy efficiency of your home.

The higher the rating the lower your fuel bills are likely to be.

The potential rating shows the effect of undertaking the recommendations on page 3.

The average energy efficiency rating for a dwelling in England and Wales is band D (rating 60).

The EPC rating shown here is based on standard assumptions about occupancy and energy use and may not reflect how energy is consumed by individual occupants.

Top actions you can take to save money and make your home more efficient

Recommended measures	Indicative cost	Typical savings over 3 years
1 Floor insulation (solid floor)	£4,000 - £6,000	£ 219
2 Insulate hot water cylinder with 80 mm jacket	£15 - £30	£ 1,182
3 Draught proofing	£80 - £120	£ 114

See page 3 for a full list of recommendations for this property.

To receive advice on what measures you can take to reduce your energy bills, visit www.simpleenergyadvice.org.uk or call freephone **0800 444202**. The Green Deal may enable you to make your home warmer and cheaper to run.

Page 1 of 4

1, Edenbridge Crescent, NEWCASTLE UPON TYNE, NE12 8EP
26 May 2018 RRN: 8308-7225-5690-2814-5922 **Energy Performance Certificate**

Recommendations

The measures below will improve the energy performance of your dwelling. The performance ratings after improvements listed below are cumulative; that is, they assume the improvements have been installed in the order that they appear in the table. To receive advice on what measures you can take to reduce your energy bills, visit www.simpleenergyadvice.org.uk or call freephone 0800 444202. Before installing measures, you should make sure you have secured the appropriate permissions, where necessary. Such permissions might include permission from your landlord (if you are a tenant) or approval under Building Regulations for certain types of work.

Recommended measures	Indicative cost	Typical savings per year	Rating after improvement
Floor insulation (solid floor)	£4,000 - £6,000	£ 73	F31
Insulate hot water cylinder with 80 mm jacket	£15 - £30	£ 394	E44
Draught proofing	£80 - £120	£ 38	E45
Low energy lighting for all fixed outlets	£15	£ 15	E45
Heating controls (programmer, room thermostat and TRVs)	£350 - £450	£ 173	E50
Replace boiler with new condensing boiler	£2,200 - £3,000	£ 456	C70
Solar water heating	£4,000 - £6,000	£ 40	C71
Replace single glazed windows with low-E double glazed windows	£3,300 - £6,500	£ 77	C74
Solar photovoltaic panels, 2.5 kWp	£5,000 - £8,000	£ 280	B86

Alternative measures

There are alternative measures below which you could also consider for your home.

- Biomass boiler (Exempted Appliance if in Smoke Control Area)
- Air or ground source heat pump
- Micro CHP

Financial Support and the Green Deal

Green Deal Finance allows you to pay for some of the cost of your improvements in instalments under a Green Deal Plan (note that this is a credit agreement, but with instalments being added to the electricity bill for the property). The availability of a Green Deal Plan will depend upon your financial circumstances. There is a limit to how much Green Deal Finance can be used, which is determined by how much energy the improvements are estimated to **save** for a 'typical household'.

You may also be able to obtain support towards repairs or replacements of heating systems and/or basic insulation measures under the ECO scheme, provided that you are in receipt of qualifying benefits or tax credits. To learn more about this scheme and the rules about eligibility, visit www.simpleenergyadvice.org.uk or call freephone **0800 444202** for England and Wales.

Page 3 of 4

Figure 9: UK EPC & Recommendations Template

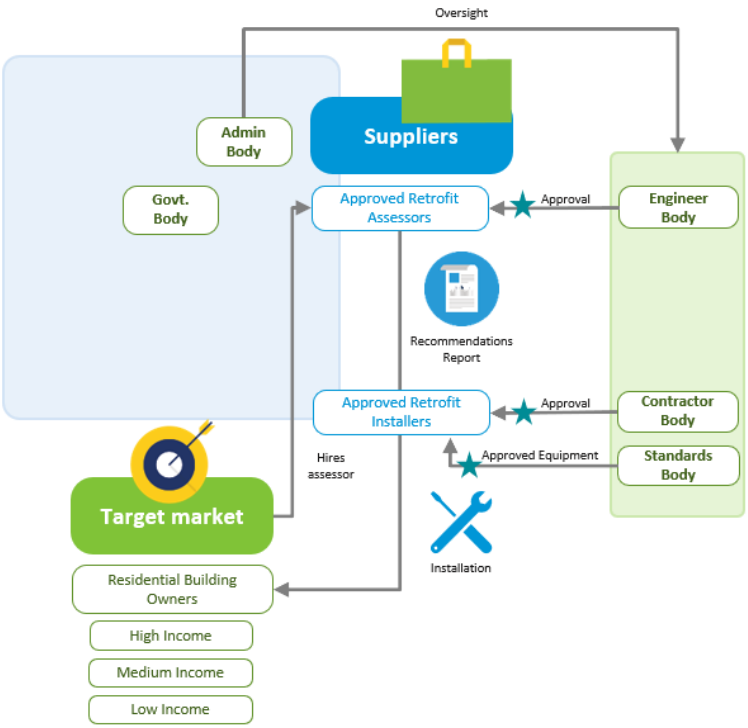


Figure 10: Schematic of Customer Process

Having received a ***Recommendations Report***, the customer can then return to the ***Scheme Website*** and search the database of ***ARIs*** for a suitable installer that is: (i) skilled in the appropriate technologies, (ii) geographically local, and (iii) well reviewed. Using the ***Recommendations Report***, the customer can request quotes, compare them, and finally select an ***ARI*** to complete the installation. In order to establish a quote, the ***ARI*** will use the ***ARA***-reviewed customer-submitted data, and the retrofit assessment and resulting ***Recommendations Report***, however they may also require a virtual or physical site-visit.

The ***ARI*** installs the measures in line with the ***Technical Installation Standards***, which will be set by the relevant technical body.

Throughout this structured process, customers are guided through the ***Scheme Website*** from assessment to quotations to installation. In each case where documentation is required, for the ***Recommendations Report***, for the provision of quotes, or for the customer's receipt of completed works, the programme will provide standardised templates for use.

Financiers: Low-Medium-High Income Segmented Financing

Different household income groups have different financing needs. The programme design recognises this, and has created two pathways that meet the specific needs of each group:

- **Medium-High Income Households:** Concessional loans via approved banks, who in turn receive concessional credit line. *Optional addition of 'contractor lending', where ARIs or the technical approval body offers loans to households that are unbankable (i.e. do not use formal banking services).*
- **Low-Income Households:** Grant covering up to 90% of total costs.

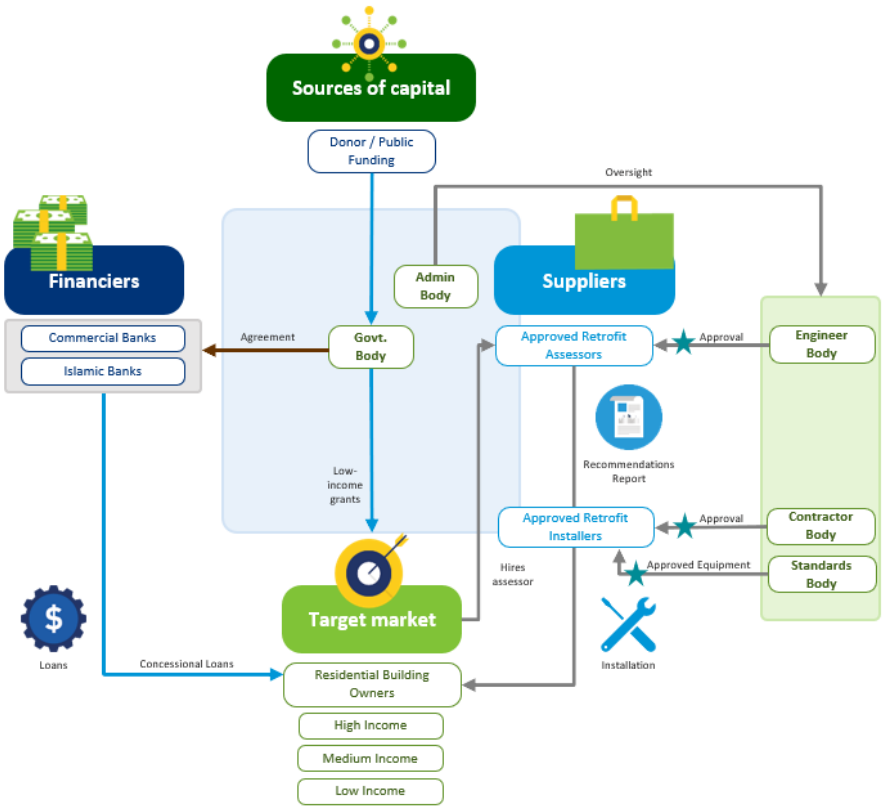


Figure 11: Schematic of Segmented Financing

Medium-High Income Households:

The ***Government Body*** of the programme will establish a number of agreements with Jordanian banks (possibly in the form of MoUs) – making them ***Approved Banks***. These agreements require the banks to on-lend a received credit line only to programme customers undertaking energy efficiency projects. The interest rate of the loan must be below market rate, and will be tied to the energy efficiency level of the project, with higher ambition projects receiving lower interest rates. For more information on the 'project score' see Certification Scheme. The credit line received by the ***Approved Banks*** will be concessional, and therefore participating banks will be able to generate a margin (up to a fixed cap) when on-lending to customers.

The German domestic development bank **KfW** runs one of the most successful home energy efficiency loan programmes to date. Banks on-lend KfW funds to their customers, according to a set criterion. Banks then draw-down funds at favourable rates from KfW to cover the loans dispersed, allowing banks a fixed margin of interest. KfW has no direct customer contact, and the credit-risk remains with the on-lending bank.

Low-Income Households:

Financing for low-income households through this scheme is simple. If the household is on the Unified Registry, which identified low-income households across Jordan, then they are eligible for a grant to cover up to 90% of installation costs for retrofit measures. This includes code compliance measures, up to 40% of the total costs. There is potential for the grants to cover the initial assessment for a 'holiday period' in order to drive initial uptake, however this is not recommended in the long-term as it risks de-valuing the retrofit assessments. The grants are applied for through the scheme website. It is recommended households apply for grants early in the process to secure the necessary upfront capital.

The UK Government's recent **Green Homes Grant** offers low-income households up to £10,000 of government grant funding to cover 100% of the cost of energy efficiency improvements.

Sources of Capital: Programme longevity

In order to deliver transformational impact, a retrofit programme needs to be in place for ten to twenty years. However, finite pots of donor funding cannot support programmes over such timescales, especially at large-scales. Consequently, a substantial risk in the implementation of retrofit programmes is that, following a successful implementation period with healthy uptake and market development, the sudden removal of donor funding causes the newly developed energy efficiency market to collapse.

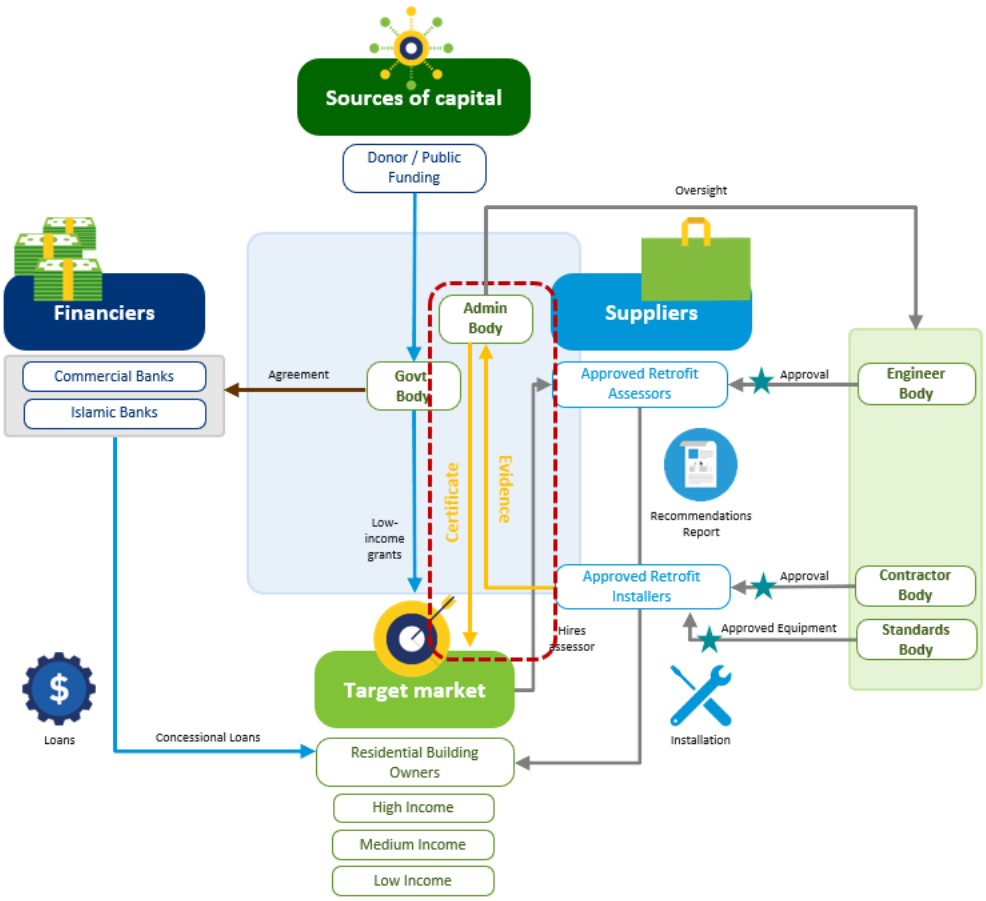


Figure 12: Schematic of How Certification Fits into Retrofit Programme

In order to safeguard against such a funding 'cliff edge', it is important to identify how a retrofit programme can recycle funding or generate revenue to pay for its essential operation and deliver self-sufficiency. A certification scheme attached to the retrofit programme can potentially achieve this. The details of this process will be laid out in the following section, however, at a high-level the impact of certification can be summarised as turning a one-directional, finite, donor-funding flow into a sustainable business model.

Each certificate is an embodiment of energy efficiency completed to a high standard using high quality equipment and qualified contractors. It therefore represents all the steps and process of the programme, particularly the 'quality framework', that have occurred through the delivery of the energy efficiency project. Due to these underlying processes, each certificate becomes a physical embodiment of 'high quality' energy efficiency work, and consequently something that customers value and thus are willing to pay a level of premium for.

Certification Scheme

There is currently no national-level building certification scheme in Jordan focused on the residential sector. There is a lack of granular data breaking down the Jordanian building stock, and its level of energy efficiency. However, as per the National Energy Efficiency Action Plan (NEEAP) of 2013, the Jordanian Government has pursued an Energy Label program for home appliances and improving the understanding of energy consumption in the residential sector. A certification scheme will build on these two activities, providing four key benefits outlined below.

Value of certifying buildings and building improvements

1. ***Build Sustainable Markets:*** **Certification creates a long term, self-sustaining, demand-driven market for energy efficiency improvements, reducing dependence on public or donor funding**

A robust certification scheme underpins the creation of a long-term, self-sustaining, demand-driven market for energy efficiency improvements by symbolising the value of energy efficiency improvements and energy efficient buildings in a way that is recognisable and understandable to the market. This is essential both to the initial development of the scheme but also to delivering an energy efficiency scheme that can ultimately operate independently of government or donor funding.

2. ***Customer Engagement:*** **Certification enables customers to easily identify and understand the value of energy efficiency improvements and energy efficient buildings**

The over-arching purposes of the certification scheme is to provide a means for homeowners and home renters to easily recognise the level of energy performance of a building, the previous works that have been undertaken and to demonstrate the value of these. A good certification scheme symbolises this value in a way that is straightforward for non-technical people to understand, clearly demonstrating the value to the homeowner in terms of impact on fuel bills, comfort and building quality.

3. ***Green Premium:*** **Certification generates a market value for energy efficiency improvements and energy efficient buildings**

In this way, a certification scheme demonstrates the value of energy efficient buildings and energy efficiency improvements to building owners, buyers, renters and landlords. This enables the value of energy efficiency of the building to be aligned and incorporated within the underlying market value of the property, providing a means by which energy efficiency improvements can generate a market value upon sale, rental or re-mortgaging of the property.

4. ***Quality Foundation:*** **Provide assurance of quality and impact for investors in to the energy efficiency scheme**

A certification scheme provides a framework through which the suitability, robustness of installation and ultimate impact (CO_2, fuel bills, energy use) of energy efficiency interventions can be monitored. This is essential to provide assurance for investors into the scheme who are seeking to deliver robust impacts against these objectives. Investors could be internal (e.g. Jordanian government, Jordanian property owners) or external (e.g. World Bank, GCF).

A robust certification process built on quality data can also enable the programme to benefit from carbon markets. Carbon emissions reduced through the energy efficiency improvements of the retrofit programme could be bought by high-emitters needing to reduce their emissions. Provide a robust data basis for measuring carbon reduction will also attract climate finance interest.

Additionally, certificates can also be used as a means of informing and focusing the distribution of grants and finance within a programme, for example by targeting higher levels of grant at buildings that demonstrate a larger improvement.

'Must haves' of certification scheme design

Of the seven design 'must haves' highlighted in the introduction to the Scheme Design, there are three particularly essential considerations and objectives that are required for an impactful certification scheme. In order to deliver self-sustaining and quality impact, the scheme design must:

1. **Motivate the homeowner to improve poorly performing buildings**

   This could be through a combination of:

   - Rational self-interest: Highlighting the costs of inaction and the benefits of action (fuel bills, environmental impact, comfort, health and wellbeing).
   - Social merit, social hierarchical value and outward value signalling: Clearly demonstrating to the wider public the societal merit of action.
   - Rewarding the actions taken, not just the final performance of the building.
   - Provide a comparison of how the building performs relative to the wider building stock and relative to an exemplary dwelling.

2. **Provide a clear pathway to improved building performance**

   This could be through:

   - Clearly identifying the individual improvements that would have the biggest impact.
   - Identifying clear next steps for the homeowner to get measures undertaken.
   - Provide an indication of likely costs and suitable times to consider installing measures (trigger points).

3. **Be robust, reliable and accurate whilst being low cost to implement**

   The Certificate should be relatively cost effective to undertake, with a focus on a robust approach to identifying performance and improvements, rather than ultimate accuracy of replicating the building physics. A necessary balance is needed between accuracy and cost of delivering the certificate. Costs will include:

   - The cost of assessment of the property.
   - The cost of lodging and processing the certificate on a centralised database.
   - The cost of maintaining an online platform for viewing the certificate.
   - Any Quality Assurance associated with property assessment.

Defining the components

As with the design of the retrofit programme above, the starting point of the certification scheme design is identifying the key components that will combine to constitute the core scheme structure.

Table 3: Summary of Scheme Components

Scheme Component	Description
Evidence of completed works	• The evidence of completion must be a combination of: product warranties, geo-tagged photos of the installed measures, design blueprints and quotation of works.
Certificate	• Document laying out the efficiency band of the building and the numerical score of the implemented project.
Building and project scoring tool	• Tool used to calculate the building-level and project score from the submitted evidence.
Project score-loan interest matrix	• Reference table mapping energy efficiency project scores against concessional loan interest rate for Approved Banks to use when providing loans to programme customers.
Certificate database	• Searchable database hosted on the scheme website which holds all certificates created through the scheme.

Defining roles and responsibilities

There are a number of key roles required for a successful certification scheme. Each role has specific associated responsibilities related to the scheme components laid-out above.

Table 4: Summary of Scheme Roles & Responsibilities

Scheme Role	Responsibility
Government Body	• Oversee and quality assure the administration of the scheme, reporting its impact to the relevant MRV body.
Certificate Administrator	• Responsible for receiving evidence of completed works and calculating the certificate using the building and project scoring tool, before sending to the customer and uploading to the certificate database. • Responsible for maintaining the searchable certificate database on the scheme website.
Approved Retrofit Installers	• Submit evidence of the completed energy efficiency retrofit works to the Certificate Administrator.
Approved Banks	• Approved by Governing Body of programme to provide concessional loans to retrofit programme customers in line with agreed 'project score-loan interest matrix'.

Certification scheme design

As part of the certification scheme design process, the project team identified and assessed five scheme options, ranging in simplicity and sophistication. The objective of this review was to find the design option with the right balance for the Jordanian context – not overly strenuous to implement, however sufficiently robust to be linked with financial incentives. The options were strength-tested in collaboration with the WB team and stakeholders. This section will outline the selected option, the other scheme design options can be found in Appendix 3.

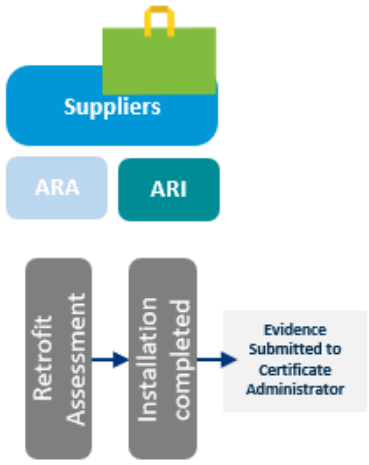


Figure 13: Connecting Point of Retrofit Programme with Certification Scheme

The starting-point of the certificate scheme is how it connects to the retrofit programme, this is shown in Figure 11 as well as previously in Figure 9 (highlighted in red).

The ARA completes a Retrofit Assessment and produces a Recommendations Report for the customer. The customer uses this Recommendations Report to gather quotes for works from ARIs, before selecting the chosen ***ARI***. The ***ARI*** completes the installation of the quoted measures (including code compliance measures, should they be required), and submits ***evidence of completed works*** digitally to the ***Certificate Administrator*** to prove the completion and generate the ***certificate***. This ***evidence of completed works*** should be a combination of: design blueprints, quote for works, product warranties and geo-tagged photos. The evidence can be submitted digitally to the ***Certificate Administrator***.

Once the ***Certificate Administrator*** receives the evidence of completion, they use the ***building and project scoring tool*** specifically tailored for use in this Jordanian scheme to produce the ***certificate***. The tool is used for two calculations: the *building level* (determines the certificate's letter band of A, B, C, etc.) and the *project score* (determines the financial incentive).

- **Building Level:** Is the points gap between the building score (after the installation of new measures) and a government-set 'exemplary' building. The Jordanian government can flex the score of this exemplary building to match the Jordanian building stock as it improves over time, for example starting at 75 points, before raising it to 83 points.
- **Project Score:** Is the sum total points accumulated by the various measures installed in the given project.

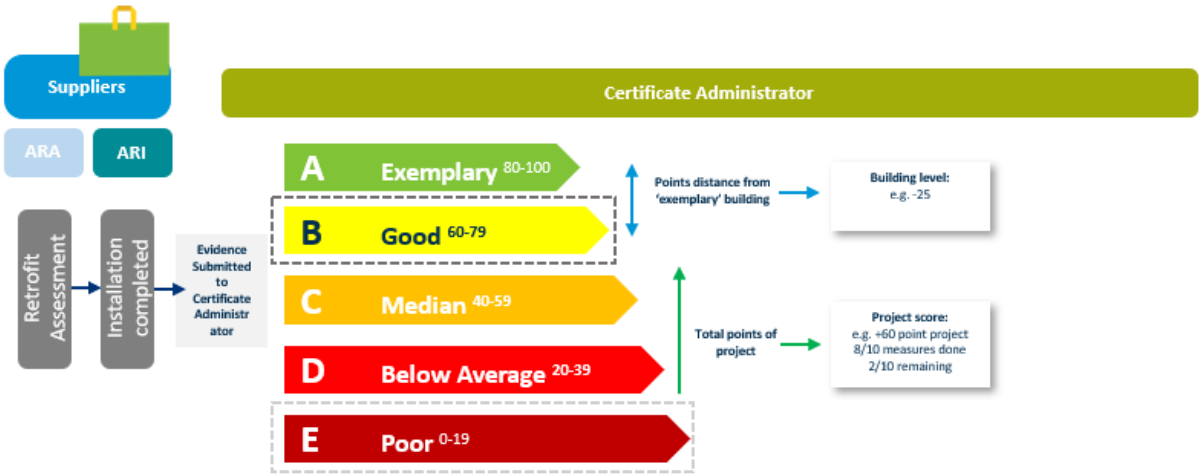


Figure 14: Process for Calculating Certificate

Both scores feature on the final ***certificate***, however they play different roles. The building-level score allows for comparison across the wider Jordanian building stock, as well as comparison against what 'good' looks like for Jordan. The project score determines the loan interest rate from ***Approved Banks*** for medium and high-income households, incentivising more ambitious projects that achieve greater efficiency improvements and thus higher scores. Mapping this design onto the Jordanian landscape, it is noted that the role of ***Certificate Administrator*** is a potentially good fit with Jordan GBC, who

could tailor their pre-existing Sawsana Building Rating Tool to calculate the certificates, avoiding the need for a new tool to be developed.

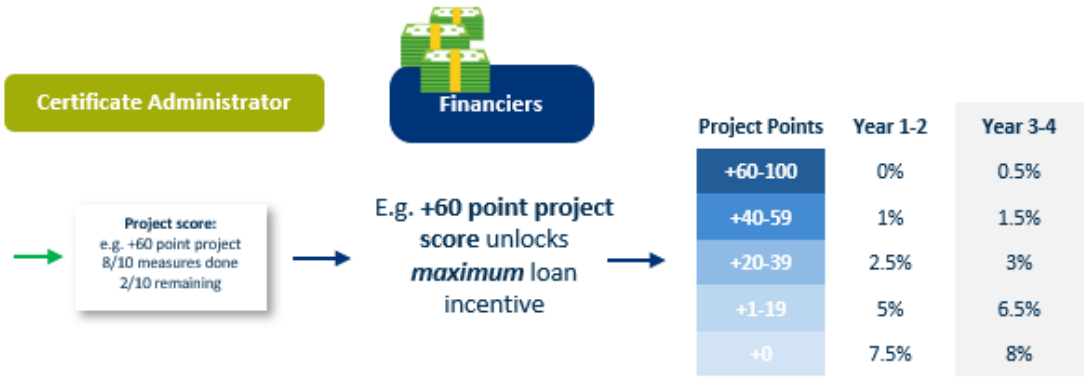


Figure 15: Project Score and Loan Interest Matrix

As part of their agreement with the ***Government Body*** of the scheme, ***Approved Banks*** are required to use the agreed ***project score-loan interest matrix*** to determine the level of concessionality received by customers seeking finance for their energy efficiency projects. The use of a pre-agreed matrix provides transparency and guidance to both banks and customers, and, by removing the room for negotiation, provides a considerable degree of certainty for customers. This certainty strengthens trust in the scheme and its administration, and builds customer confidence, reducing the likelihood of drop-off. A similar matrix is not required for the grants provided to qualifying low-income households, who receive funding to cover up to 90% of the installation costs.

Note: the interest rates currently shown in Figure 13 are placeholders to provide an indication, the matrix will be agreed between Approved Banks and the scheme Governing Body.

One benefit of the project score process is that once a customer knows what measures they will be installing through the retrofit project (having received a Recommendations Report and agreed a quote with an ***ARI***), the ***ARI*** will be able to inform the customer of the project score. Providing the understanding of the 'impact' of the project earlier in the process is valuable. By providing the project score earlier, customers can seek out an ***Approved Bank*** prior to installation, and request and receive a loan (in line with the loan interest matrix) prior to the completion of works.

Figure 16: Certificate Administrator Provides Certificate to Customer

Having received the ***evidence of completed works*** from the ***ARI***, and used the ***building and project scoring tool*** to establish the building-level and project scores, the ***Certificate Administrator*** produces the ***certificate***. The ***certificate*** will show: the letter band of the building, the project score of the specific project just completed and the measures not yet implemented. Payment for the production of the certificate will be taken from the ***ARI***, who will likely pass this cost down to the customer.

Alongside providing the certificate to the customer, the ***Certificate Administrator*** will also upload it to the ***certificate database*** on the scheme website –

ensuring that any personal details are sufficiently anonymised. Over time, this searchable database will develop into a valuable source of data on the Jordanian building stock, as the EPC and DEC registers are in the UK.

Summary of Financing

The funding of the overall scheme is simple. The initial injection of funding will come from either donor or public funding, and be provided to the ***Government Body*** overseeing the scheme. This funding will support administrative costs of the ***Administrative Body*** and ***Standards***, ***Engineer*** and ***Contractor Bodies***, ensuring the processes, templates, tools and training are established. Over time, ***ARAs*** and ***ARIs*** will be required to pay an approval fee for the ***Quality Mark*** they receive from ***Engineer*** or ***Contractor Body***. This will transition the 'quality framework' of the retrofit programme towards a self-sustaining model.

A significant portion of the funding will be allocated to low-income grants, covering the cost of ***Recommendations Reports*** and installation. The remaining funds will be provided to ***Approved Banks*** as concessional credit lines, with the accompanying condition that the credit lines are on-lent at below market-rates to customers installing energy efficiency measures. ***Approved Banks*** provide loans to customers based on the project-score of their retrofit project, as per the ***project score-loan interest matrix***. Customers use either these grants or loans to pay the ***ARA*** and ***ARI*** fees. Customers will pay back these concessional loans to the ***Approved Banks***, who will in-turn pass the repayments back to the ***Government Body***. Through this repayment, a portion of the initial donor or public funding received is recycled by the ***Government Body*** for use in providing more credit lines and thus customer loans.

The creation of the ***certificate*** incurs a cost for the ***Certification Body***. Initially this may be covered by donor or public funding. However, over time, in order to sustainably cover this cost, the ***Certification Body*** will charge the ***ARI*** for the ***certificate***, who in turn pass this cost on to the customer. Customers will be willing to pay this premium, due to the value of the ***certificate***, this therefore results in customers helping to support the administrative process of certification.

Non-Formal Financing Options

Jordan has a high number of 'unbankable' households, who do not access formal banking services. This is in part due to high rates of informal working, and so failing to meet bank requirements, as well as general mistrust and a preference for borrowing from friends or family. In order to reach this large segment, it is crucial that the scheme includes alternative financing avenues for households who cannot receive grants, but also cannot or will not access ***Approved Banks***. The proposed solution for this is to establish 'client financing', whereby ***ARIs***, the ***Engineers Body***, or the ***Contractors Body*** can provide concessional loans (flowing from the ***Government Body***) to customers. This could build trust for customers, who would already be interacting with the ***ARI*** for example, and even simplify the customer journey by making ***ARAs*** and ***ARIs*** the only customer points-of-contact.

Attracting Climate Finance

International climate finance is a significant potential source of funding for the scheme. The crucial requirement for accessing climate finance is the ability to evidence emissions reduction through the activity. By tracking the energy reduction achieved by installed retrofit measures on the ***certificates***, the scheme will be able to estimate a carbon reduction per retrofit, and therefore the total carbon reduction of the scheme. As the sophistication of the data collection supporting the ***certificates*** improves, the scheme could extend into tradability, which would be of interest to climate financiers.

Customer Journey

> The customer journey of the retrofit programme and certification scheme is underpinned by the scheme website and database. This single touch-point for the customer simplifies and centralises the journey, maximising customer engagement and minimising opportunities for drop-off. Additionally, the certification process occurs as an automated function for the customer, with no input required from the ARI submitting evidence to receiving the certificate.

> By digitising the scheme administration, the approach is agile and future-proofed, enabling it to be more easily adapted and adjusted for future uses, with a reduced operating cost. It is also resilient within the context of a post-Covid world by reducing dependency on site visits and paper trails. Customers lacking internet access can contact the administrative body by phone and request information. It is expected that ARAs and ARIs will proactively engage customers and provide information regarding the scheme, so as to generate business leads.

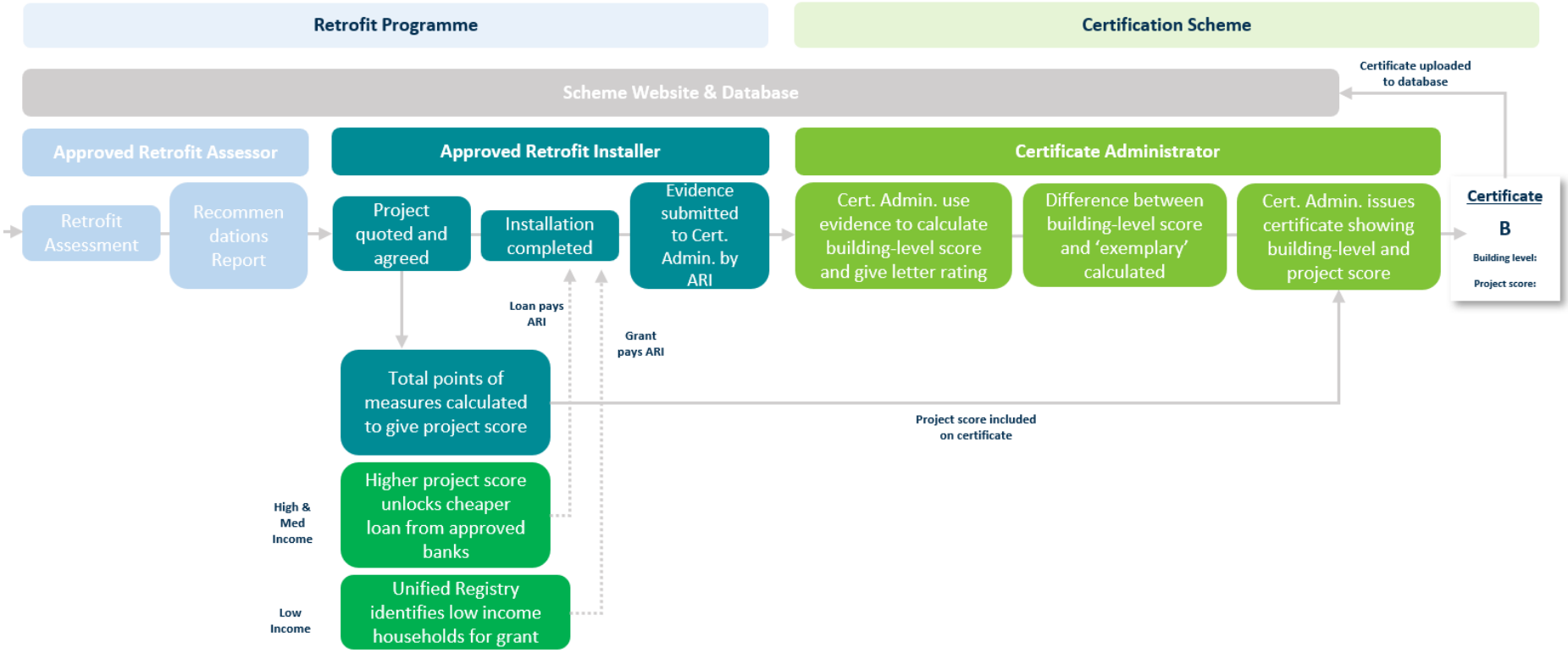


Figure 17: Schematic of Retrofit and Certification Customer Journey

Monitoring, Reporting and Verification (MRV) and Legal Frameworks

Throughout the technical design process, recurrent conversations were had with local stakeholders to ensure that the design was taking into consideration local legal frameworks and existing systems. This section outlines how the existing Jordan MRV system can be utilized for implementation of the scheme, and also highlights key legal considerations.

MRV system

In April 2019 the Jordanian Council of Ministers approved bylaw 79 titled "The Climate Change Bylaw". This bylaw delegated the Ministry of Environment with the responsibility of establishing and managing a database to document emissions data, adaptation and reduction measures, and the climate fund data as "database of the National Inventory Record". It also assigned The Ministry of Environment as the national contact point for the UN climate change framework agreement and the protocols and funds that stem from it.

The bylaw states the general framework and workflow of the MRV system, and it mandates certain entities to provide annual reports (or whenever necessary) to report the initial data that are related to sectorial GHGs, and performance indices that are related to adaptation, in order to be included in the National Inventory Record. It also mandates that certain entities, covering most of the governmental bodies, allocate a point of contact with the ministry as part of the MRV system. The contact points would report the initial data required for emissions calculation, information about sectorial climate change plans, and information about the performance of nationally or internationally funded measures related to climate change.

In this context the Ministry of Environment in collaboration with the WB have been working with different ministries and entities to develop a robust MRV system in Jordan. The system is still under development and is currently in the data input and testing phase. It has an integrated multi-tier framework that tracks GHG emission levels, progress and impact of mitigation actions, and the support received and used. The scope of this scheme intersects with the latter two tiers; mitigation impact, and support received and used. The calculation of GHG emissions and the mitigation impact will be based on IPCC guidelines.

At this stage the reporting only includes the energy sector data. However, the Ministry of Environment is considering the allocation of resource for the building sector in the future. The MRV system in its current shape is user or contact-point based, where each user can login to the system to fill in the general project information, including start and end date, project phase, governorate, and city. In addition to the main benefits and the co-benefits of the project, the user can add the project milestones, financing sources and attach supporting documents.

To this date many governmental entities were trained on system usage, including personnel at JREEEF. This supports JREEEF's case as candidate Government Body, since this role oversees MRV data flow and thus must have trained personnel and access to the MRV system.

The inclusion of the programme in the MRV system will require an approval procedure. Once the programme is approved reporting process will be established. The system includes numerous interactive reports and key performance indicators that assist the decision makers in seeing the greenhouse gas emission reduction efforts, and assists in preparing the NDCs and all GHG related reports. This will enable a systematic approach to evaluate the programme and improve it over time.

Building code compliance

Enforcement of code compliance is a challenging topic in Jordan, especially for codes related to energy efficiency in buildings. According to the National Building Law, and the bylaws stemming from it, the National Building Council is the entity responsible for building codes development and enforcement in Jordan. There were many efforts in the past few years to improve code compliance and enforcement. The most significant efforts were the modification of the National Building Law in 2018 where motions were made to clarify issues related to code compliance and enforcement. Moreover, in 2020, new instructions were released stemming from new supervision and inspection bylaw number 52 for the year 2020. These instructions mention that the inspection committees could inspect existing buildings if requested by the NBC.

As per phrase 3 of the aforementioned bylaw, the inspection objective is to ensure contractors compliance with safety and building codes' requirements and to ensure construction as per engineering drawings. However, the inspection done by committees does not replace the supervision role of the engineering consulting firm, donors, or the permit issuers.

In this context, and given that the scope of interventions within our programme will not include any structural modifications, the supervision of works by assessors and the certification body inspection and approval would be sufficient to ensure code compliance for the works performed under this programme. This keeps the door open for inspection by the committees if needed. It is worth noting that the programme will facilitate more code compliance to existing buildings through giving precedence to measures that deliver code compliance within the set of recommendations.

Assessors

The role of the assessors will include assessing the current building status, recommend energy efficient measures, inspect and verify measures implementation, and report to the certification body. These tasks could be done by accredited individual engineers through an agreement with the engineering and certification bodies, or since these might be considered as engineering consulting tasks it might require the assessor to be part of a registered engineering consulting firm through the Committee of Engineering Consulting Firms (if deemed feasible). Moreover, the assessors' role is simplified and doesn't rise to the level of energy auditors. So, their role does not require permit from MEMR.

However, engineers working with Energy Services Companies that are legally registered and permitted to work by MEMR, could work as assessors as well. It would be mandatory for all assessors to get accredited and trained through the Engineer Body along with the Certification Body to perform the role of assessors.

Contractors and skilled labour

Contractors in Jordan are regulated through law No. 13 of the year 1987, "construction contractors law ". The law mandates conditions for contractors to be able to work in Jordan. First, they must get a work permit from the ministry of Public Works and Housing, and then be registered and categorised by JCCA and registered at the Ministry of Industry and Commerce. The categorization of contractors is done in two folds, the first related to specialty, where the "buildings" category is most relevant and specifically those that sub specialize in building maintenance. The second categorization has to do with the contractors experience and resources, and they are categorized from first degree to sixth degree. The relevant categories for the programme along with a list of interested contractors will be arranged with JCCA. Certain requirements might be added for contractors to be able to join the programme, such as those related to skilled labour and training related to EE renovations in residential buildings.

A condition for joining the approved list of contractors could be the inclusion of trained skilled labour in the work force of the contractor. Those skilled labour could be trained through the Vocational Training Corporation and the National Company for Employment and Training to carry out renovation works in the EE programme.

Materials, appliances, tools and equipment

Many entities in Jordan are working and collaborating to provide lists of Energy Efficient materials, appliances, tools and equipment in accordance with their relevant bylaws. There are efforts done by the National Building Council, Jordanian Customs Department and MEMR. All those efforts intersect with the work of the Quality Commission (formerly JSMO).

The Admin Body of the programme should coordinate closely with these entities to build on the work that has already been done in this field and further develop it to achieve the programme objectives. Those collaboration efforts to develop the list of approved materials must flow through the Quality Commission as a main stakeholder in this field.

Implementation Roadmap

The technical scheme design outlined in the previous sections was presented to stakeholders during a joint ministerial session, which included senior representatives from MEMR, JREEEF, MoENV and MPWH. The session led to consensus on three key areas: (i) all agencies recognize the strategic importance of stimulating EE in the residential sector to unlock economic, social and environmental benefits, (ii) the technical scheme design proposed, grounded by the quality framework of a EE retrofit programme and a certification scheme as a market-based instrument is a vehicle with high potential for success, and (iii) Jordan already has key institutions and companies that have the potential to help advance such a programme, though there are gaps in capacities and skills.

However, it was also recognised that in order to implement this conceptual design, there are practical considerations that need to get resolved before the implementation of the full proposed programme is a possibility.

An implementation roadmap has been designed which sets out three phases to facilitate a successful rollout. Lessons from international experience in design and implementation of such programmes highlight the importance of a staged implementation progress which allows to build on progress and incorporate lessons from pilot programme implementation into the programme design. The three phases and indicative timeframes are outlined below:

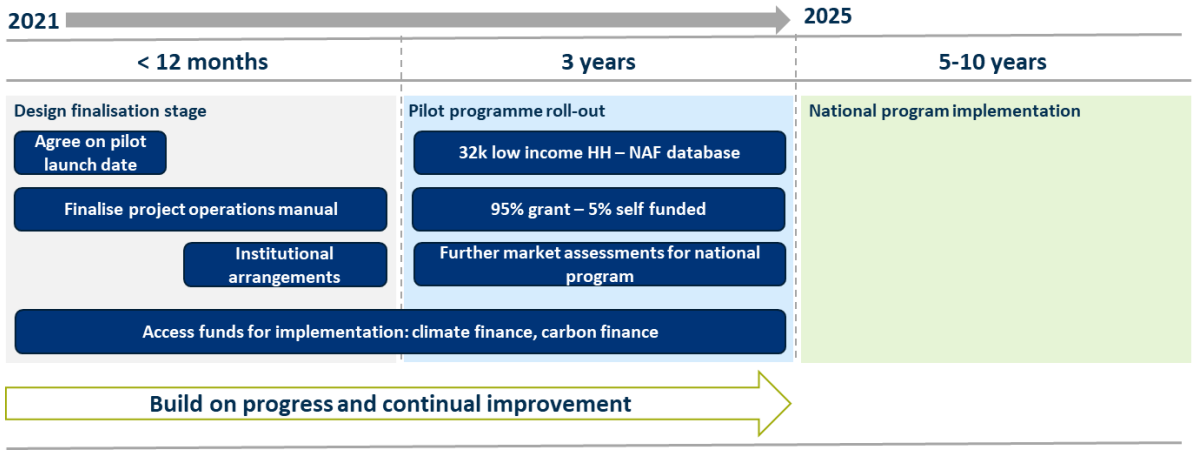


Figure 18: Implementation Roadmap

Design finalisation stage: ~12 months

Much of the technical scheme design has already been presented and accepted by key stakeholders. However, there are final details and agreements which can be completed during a ~12-month design finalisation process.

This project has already facilitated constructive conversations and consensus between the key players and decision makers. At this point, a key objective is to agree on a pilot launch date (e.g. Q1 2022). Setting a deadline will act as a motivator to build momentum and focus scattered efforts into a single pilot. This level of commitment will also send positive signals to the donor community, and will enable conversations necessary to access funds to fund the pilot programme rollout, and potentially also fund the national programme.

In parallel, during this 12-month period, the development of the programme operations manual can be executed to iron-out the final pieces of information needed to deliver a successful pilot programme.

This will provide the full details on how the scheme will be implemented, including governance, finance, fiduciary and socio-political context. During the stakeholder consultation and research phase of this current project, it was determined that the key areas which need further focus are:

- **Low-income market assessment** – understanding in more detail the low-income residential sector, as this group will be targeted first. This should include leveraging data from the National Aid Fund (NAF) and Household Income Expenditure Survey (HIES).

- **Approved retrofit assessors and installers** – upskilling is essential to shortening the technical knowledge gaps, and to ensure there is sufficient capacity of trained assessors to deliver a pilot. This must include understanding the programme, the assessment and certification processes and being approved by the engineering body.

- **Equipment suppliers** – a short market assessment is needed to identify equipment suppliers able to provide the measures included in the Approved Equipment list issued by the standards body. Most particular to the pilot project is the understanding of local supply chains and pricing for the included measures. There is a particular need to look at thermal insulation suppliers, as this type of intervention is less common in Jordan.

- **Certification process and legal frameworks** – preparatory work is done to ensure the process and issuance of certificates aligns with all statuary legal standards.

It is recognised that this programme is designed to be of minimum burden to government, however it has been identified that there are various institutions already in place which could deliver many of the functions outlined in the 'Roles and Responsibilities' sections of this report. Further high inter-ministerial roundtables should be set up to first finalise the high-level institutional arrangements, and then a broader consultation with public and private actors could enable the assignment of the other responsibilities.

The proposed pilot will be targeted at low-income Jordanian households. These households will be determined and targeted using the NAF database (32,000 households), with prioritisation by income and no filtering by 'technical criteria' – this will avoid unexpected income discrimination. Instead, a needs-led approach will be taken; a quick assessment survey will be circulated to households allowing them to directly express their needs. It is hoped that up to 20,000 households could be addressed through the pilot. It I recognised that this is highly ambitious and will require aggressive roll-out, however, within the context of the Covid-19 economic crisis, we propose the scheme is viewed in a similar light to post-WWII economic recovery efforts to deliver mass labour employment.

The prioritisation steps for household inclusion are as follows (please note, all figures shown are illustrative):

(i) Establishing quotas

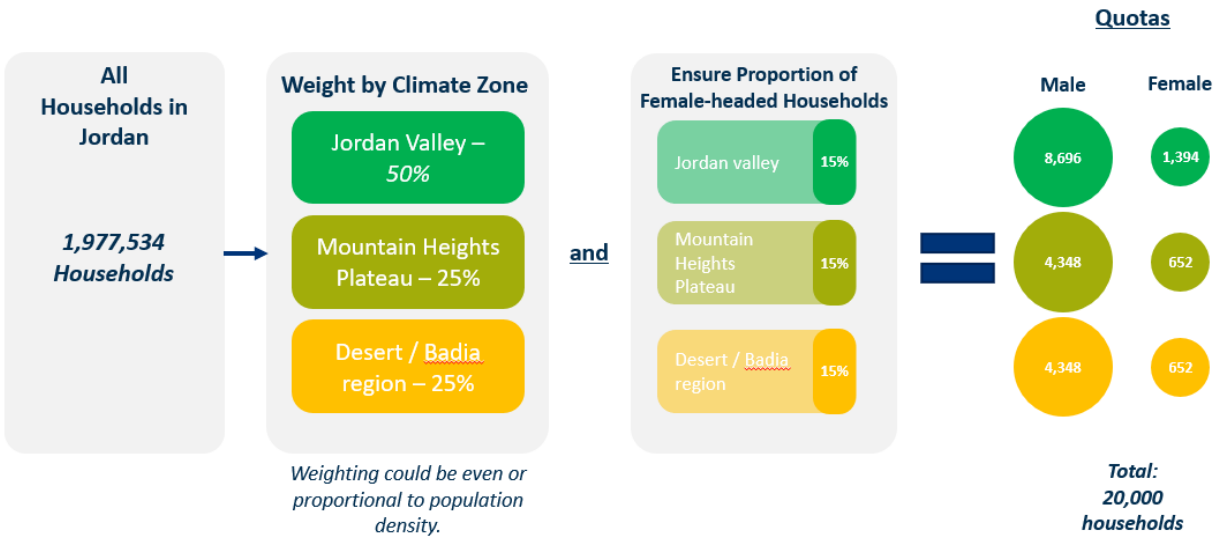


Figure 19: Process for Establishing Household Quotas

Establishing quotas that reflect each of the climate zones in Jordan will ensure the pilot collects useful data and provides relevant learnings for a nationwide programme. Including a minimum proportion of female-headed households where possible will have positive gender equality and inclusivity impacts, as it is expected that female-headed households would be less likely to access support due to time constraints and other contextual factors.

(ii) Prioritising from bottom of income scale

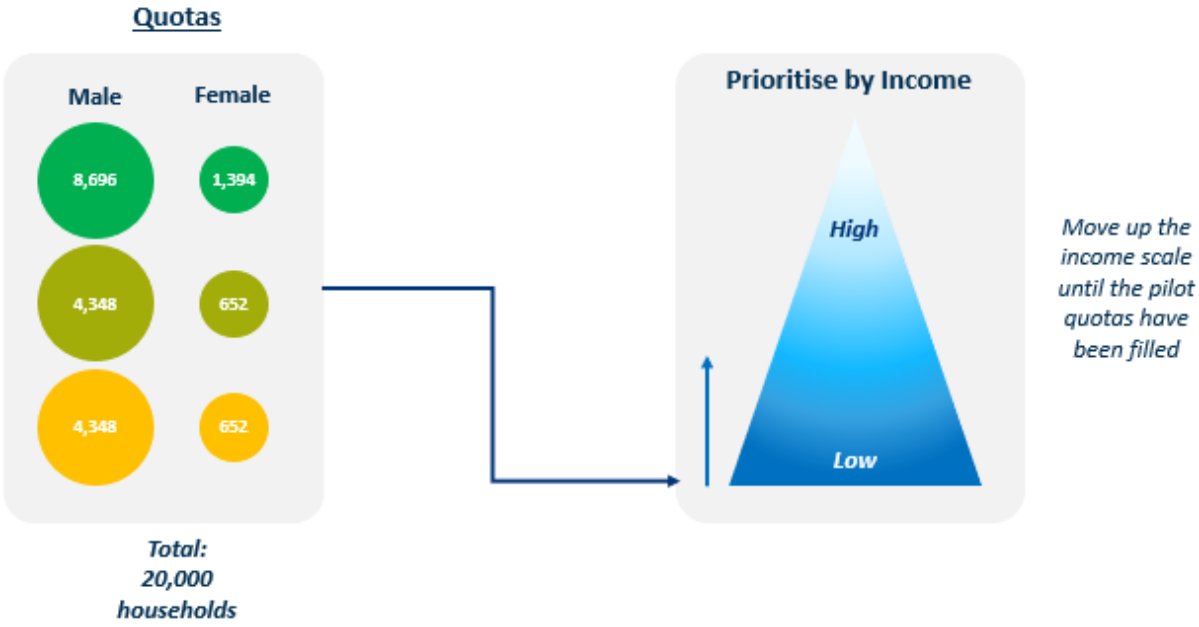


Figure 20: Process for Prioritising Households by Gender and Income

The quotas for male-headed and female-headed households in each climatic zone will be filled starting from the bottom of the NAF database, ensuring that the lowest income households in Jordan are included first. This continues until the designated quotas have been filled.

(iii) Matchmarking measures with household needs

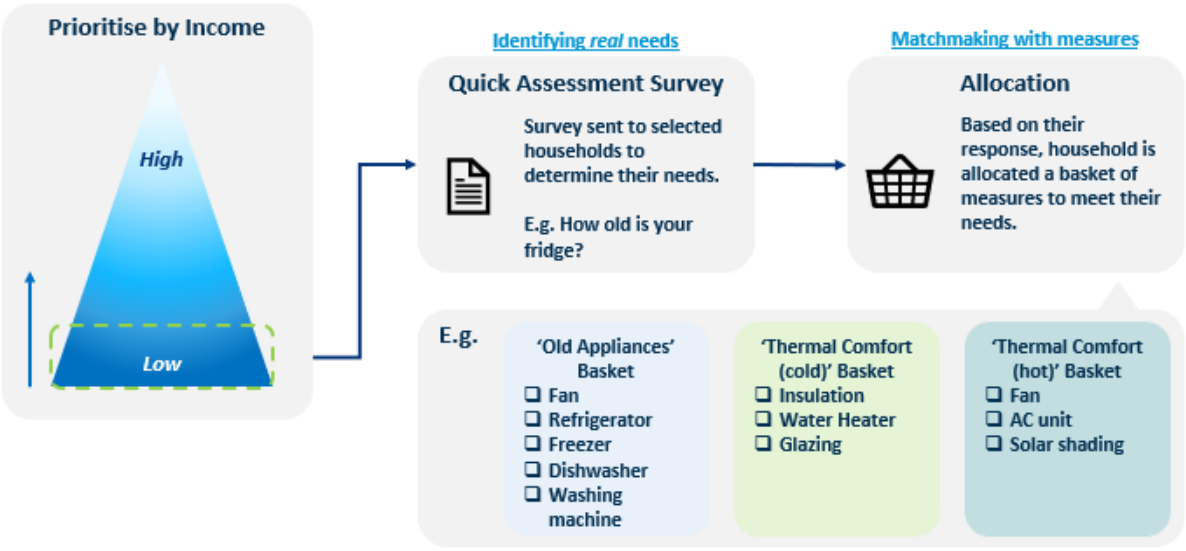


Figure 21: Allocation of Measures Based on Real Needs

The NAF and HIES data could also be used to pre-determine several 'baskets of measures' an average low-income apartment or house could be expected to implement in different climatic zones, and subject to different needs. For example, this could be determined by assessing the dominant heating and cooling technologies used in households of different climatic zones, or by assessing the market penetration rates of common household appliances. These baskets will be matched with the communicated needs of income prioritised households, simplifying the programme whilst delivering needs-based impact.

To summarise:

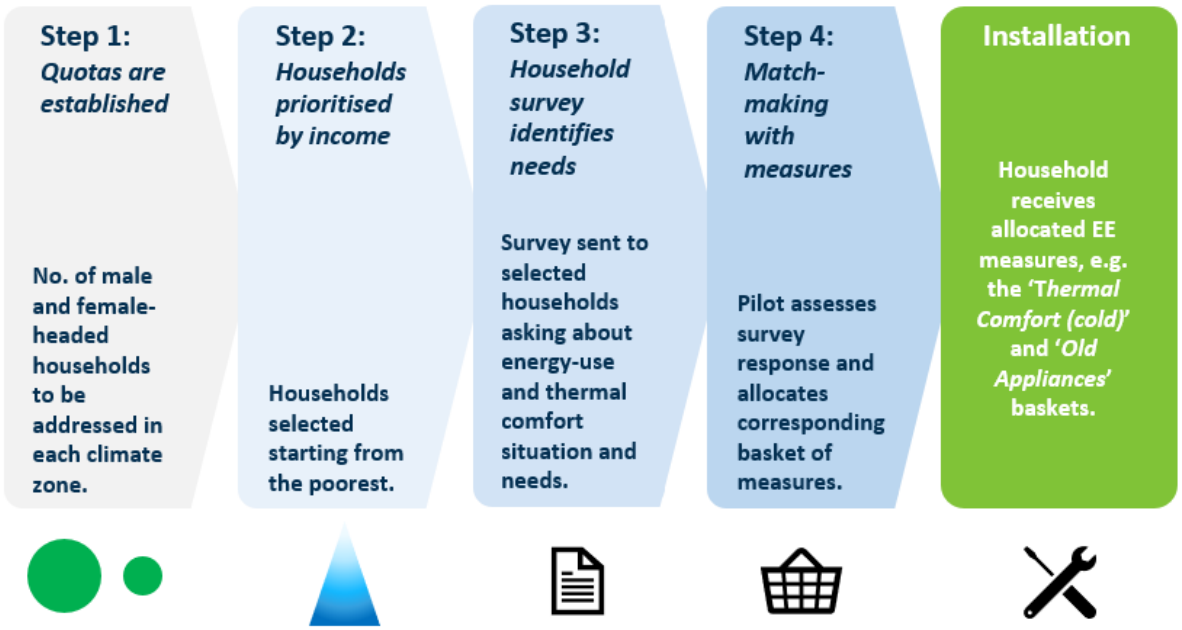


Figure 22: Step by Step Household Prioritization Process

Data Management

Implementing a scheme of this scale using digital platforms as a key design pillar and for an area as data-rich as energy efficiency requires a robust data management and security approach. The 'design finalisation' phase will focus on the acute practicalities of delivering the scheme in Jordan, and data policy will be a key element of this. Data policy should be discussed with all key decision-makers and relevant bodies, including data collection, storage ownership and handling. A well-thought-out process, which streamlines data flow with minimal room for error and easy plug-in capabilities with national MRV systems and other reporting tools will significantly reduce the resource burden of the scheme, and increase its utility. For a more detailed consideration of data management and security through the implementation process, see Annex A – JREEEF Review Report.

> Initial feedback from key stakeholder regarding the pilot has been positive. There is a recognition of the value of having a further 'design finalisation stage' to cement exact implementation details, before running a pilot that will give the systems a 'test-run' and enable final improvements to be made to the full design, improving its chances of successful roll-out.

Pilot programme roll-out: 3 years

Upon completion of the design finalisation stage, it is proposed that a three-year pilot programme is launched. This would allow a part of the EE buildings retrofit and certification programme to get off the ground by gradually building the capacities of the key implementing bodies. The gradual injection of capital to the supply chain will also help to augment their capacities and will give the market three years to improve via learning-by-doing. This majorly grant funded phase will enable the setting-up of key elements of the scheme and give the programme a jump-start towards further market-based implementation.

During this phase, further market assessments should be carried on to identify how the existing elements of the program would play out at a larger scale.

It is suggested that the target market for the pilot should be low income households based in Amman. Low-income households have the highest potential to benefit from such a programme, and the technical capabilities of the supply chain are strongest in Amman. It is likely that under the current economic conditions, international funders can be compelled to invest in a programme with such stimulus potential.

A high-level modelling exercise was done to project what the potential cost and benefits would be if such a program was implemented in households identified in the NAF 2019 beneficiaries list (as outlined in the previous section). Implementing EE initiatives across all these households is a very ambitious task, however it must be outlined that this has the potential to be a significant economic recovery activity for Jordan, which phased out over a few years can lead to significant economic reactivation.

The modelling was based on the most up to date publicly available data on EE savings potential in the Jordan domestic sector, using the best assumptions available from two main reports: "*Improving the Energy Efficiency of the Residential Buildings in Jordan*" from the Jordan University of Science and Technology, and "*Developing and energy benchmark for residential appartments in Amman*" from Jordan Green Building Council. Further assumptions are outlined in Appendix 1.

The cost of a lower-income household programme involving 32,000 buildings – comprising a proportion of traditional family houses (40%) and apartments (60%)– would equal $81.2 million. The overall intervention would save 66.9 GWh of electricity per year, resulting in $6.7 million annual savings from reduced energy consumption, and a payback period of 12 years. Almost 1,000 full-time jobs would be created, both through direct and indirect effects.

National roll-out

It is important to highlight that during the pilot programme phase, a continual feedback mechanism needs to be put in place to ensure that key lessons from the pilot programme implementation are recorded, and are considered for continual improvement of the programme. This will allow for re-design or finessing of any of the programme elements, to be ready for national programme implementation. It is expected the full programme implementation will significantly contribute to furthering the second National Energy Efficiency Action Plan (NEEAP), which laid out a 998 GWh saving against a 2006-2010 averaged baseline, equating to 22.4%.[18]

Plans for the national roll-out will be developed during the final implementation phase, and then reworked as necessary following any feedback from the initial pilot.

[18] JREEEF (2017), 'The Second National Energy Efficiency Action Plan (NEEAP) for the Hashemite Kingdom of Jordan'. Available from: https://www.memr.gov.jo/EBV4.0/Root_Storage/AR/EB_Info_Page/2nd_NEEAP_(2018-2020)_final__clean_November__2017_(2).pdf

Appendices

Appendix 1: Estimated Pilot Programme Impact

A high-level modelling exercise was done, based on the report "*Improving the Energy Efficiency of the Residential Buildings in Jordan*" from the Jordan University of Science and Technology. The cost of a lower-income household programme involving 32,000 buildings – comprising a proportion of traditional family houses (40%), apartments (60%), and villas (0%) – would equal $81.2 million. The overall intervention would save 66.9 GWh of electricity per year, resulting in $6.7 million annual savings from reduced energy consumption, and a payback period of 12 years. Almost 1,000 full-time jobs would be created, both through direct and indirect effects.

Methodology

All assumptions for costs, energy and financial savings, and CO2e emissions reduction are taken from the paper "*Improving the Energy Efficiency of the Residential Buildings in Jordan*" from the Jordan University of Science and Technology.[19]

The total cost of energy efficiency interventions is described in the following table:

Total cost ($)	Level 1	Level 2	Level 3
Traditional family house	230	3,486	4,986
Apartment	647	2,154	8,266
Villa	750	4,896	22,926

The different energy efficiency measures included for each level are available in the Jordan University paper, as is the average cost of electricity (0.074 JD/kWh, or 0.1 USD/kWh). The figures for apartments was calculated as the total cost for a divided by five, as the paper reported values referring to multiple-story buildings. These figures were then used to estimate the cost of different interventions for each building type.

The following assumptions were then integrated in the model:

1) The cost of a single interventions must be within the programme budget, which is set at 4,000 JD ($5,642);
2) The cost of moving from one level to the other is equal to the cost difference between the two interventions. E.g. for a traditional family house, the cost of moving from Level 2 to Level 3 energy efficiency is equal to $4,986 – $3,486 = $1,500;
3) Households that already have a Level 3-equivalent energy rating will not participate in the programme;
4) All interventions must achieve at least a Level 2 energy rating;
5) The proportion of housing type within the programme is defined as follows:
    a. Traditional family houses: 40%
    b. Apartments: 60%

In addition, it is assumed that all households that participate in the programme are evenly distributed among: 1) their starting point for energy efficiency rating; and 2) the available interventions they will opt for during the programme. This means that – when all intervention types are available within the individual budget – we have an equal distribution of households going from Level 0 to Level 2, Level 0 to Level 3, Level 1 to Level 2, Level 1 to Level 3, and Level 2 to Level 3. Because the cost of Level 3

[19] Bataineh & Alrabee (2018), 'Improving the Energy Efficiency of the Residential Buildings in Jordan'. Available from: https://www.researchgate.net/publication/325980254_Improving_the_Energy_Efficiency_of_the_Residential_Buildings_in_Jordan

interventions for apartments is above the budget, these can will only move up to a Level 2 energy efficiency rating.

The baseline energy use is calculated using the annual energy use intensity factor (91.4 kWh/m2) provided by the Jordan Green Building Council,[20] multiplied by the average floor area for housing type from the Jordan University paper:

	m2	Annual kWh
Traditional family house	144	13,162
Apartment	73.6	6,727
Villa	240	21,936

Results

The average energy and financial savings are calculated using the proportion of energy saved by each intervention, in accordance with the national-wide results reported by Jordan University. A summary is provided in the following table:

Average per building	Intervention cost (USD)	Energy savings (kWh/year)	Energy savings (USD/year)	Payback (years)
Traditional family house	3,597	2,431	243.06	14.8
Apartment	1,831	1,862	186.21	9.8
Villa	4,521	3,552	355.19	12.7

For the whole pilot (32,000 buildings), comprising a proportion of traditional family houses (40%), apartments (50%), and villas (0%) this translates to:

Total programme	Total cost (USD)	Energy savings (kWh/year)	Energy savings (USD/year)
Traditional family house	46,039,040	31,111,149	3,111,115
Apartment	35,145,600	35,752,755	3,575,276
Villa	-	-	-
Total	81,184,640	66,863,904	6,686,390

The number of jobs created by the programme is calculated using a factor of 11.9 jobs for every $1m invested[21] - including direct and indirect full-time jobs - resulting in 966 jobs created. Direct jobs relate to the auditing and the installation of the measures, and indirect jobs relate to the production of these measures.

Two contribution values were used to calculate the programme and household cost for the intervention outlined above; one in which the programme covers 95% of total costs, and the other in which it covers 90%:

[20] Jordan Green Building Council, 'Developing an Energy Benchmark For Residential Apartments in Amman'.
[21] Bataineh & Alrabee, 'Improving the Energy Efficiency of the Residential Buildings in Jordan'.

Contribution by programme	95%	90%
Average programme cost per building (USD)	$2,410	$2,283
Average household cost per building (USD)	$127	$254
Total programme costs (USD)	$77,125,408	$73,066,176
Total household costs (USD)	$4,059,232	$8,118,464

Appendix 2: International Examples of Retrofit Programmes

This is a summary of the various international examples of best-practice retrofit programme referred to throughout the retrofit programme design section.

TrustMark (UK)

The UK Government has successfully implemented a similar approach to the proposed 'Quality Mark' through the TrustMark, a government-endorsed third-party quality scheme for contractors. Quality is defined against technical competence, customer service and trading practice. The latest large-scale energy efficiency stimulus from the UK Government, the Green Homes Grant scheme, requires TrustMark contractors be used.

KfW 'Energy-Efficient Refurbishment' programme (Germany)

The German Government's KfW 'Energy-Efficient Refurbishment' programme utilises a searchable online register. All experts involved in the planning and construction process must be listed. Requirements for listing include: proof of professional experience and quality, re-listing every three years, and ongoing training to keep pace with technical, legal and market developments. As part of this programme, KfW runs one of the most successful home energy efficiency loan programmes to date. Banks on-lend KfW funds to their customers, according to a set criterion. Banks then draw-down funds at favourable rates from KfW to cover the loans dispersed, allowing banks a fixed margin of interest. KfW has no direct customer contact, and the credit-risk remains with the on-lending bank.

Certificar e Valorizar scheme (Portugal)

The Portuguese Certificar e Valorizar scheme uses an online platform with searchable expert and certificate databases. Customers input information regarding energy-use and building type and receive recommendations of retrofit measures and approved local installers. The scheme is managed by ADENE, the Portuguese national energy agency, which is a private non-profit 'public interest institution'. The 'expert search' covers building energy audits or qualified certificate providers, the 'technicians search' covers installation and maintenance contractors.

Green Homes Grant scheme (UK)

The UK Government's recent Green Homes Grant offers low-income households up to £10,000 of government grant funding to cover 100% of the cost of energy efficiency improvements.

Appendix 3: International Examples of Certification Schemes

Certification scheme options considered

As part of our analysis we considered the relative merits of 5 different options for Certification schemes. To consider the relative merits of each approach, we scored each against the following criteria for an impactful Certification scheme.

Stakeholder	Value source
Owner occupiers	Feel good factor / environmental consciousness
	Good citizen
	A road map to better performance / cost / comfort
	An educational / informational tool
Building owners	Increase property value
	Increase rental value
Renters	Enables informed decisions prior to rent
Tradespeople	Highlight opportunities in the market
Government / Other	Data on the building stock
Banks	Additional information relevant to mortgage / loan
International Climate finance / donors	A mechanism for allocating carbon based finance / grant

Option 1: A Project Based Quality Standard and Label

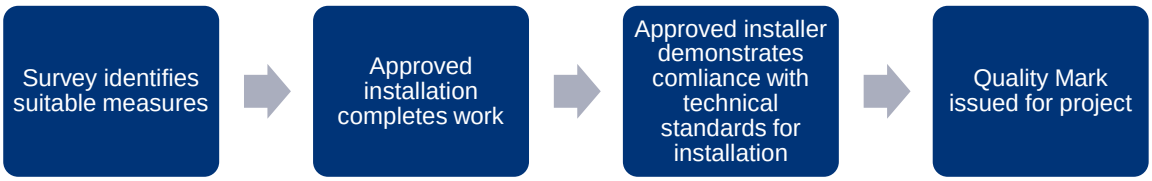
Description: A Quality Mark certification scheme makes no assessment of the building energy performance. Rather it is a straightforward stamp that signifies a building has had work undertaken to the specified standard of quality and impact.

Examples of existing quality marks include:

Fairtrade	UK Trustmark	Forestry Stewardship Council
FAIRTRADE®	TRUSTMARK Government Endorsed Quality	FSC® Forest Stewardship Council®

The FAIRTRADE Mark is a registered certification label for products sourced from producers in developing countries. The Mark is used only on products certified in accordance with Fairtrade Standards and on promotional materials to encourage people to buy Fairtrade products	UK Government Endorsed Quality Scheme covering work a consumer chooses to have carried out in or around their home.	FSC is a global forest certification system established for forests and forest products.

Process



Pros:

- Rewards actions (both big and small).
- Easy to understand.
- Easily identifiable (although this depends on the level of take up).
- Direct association with quality, not just energy performance.
- Lower cost to implement (limited need for building performance assessment).

Cons:

- Value relies heavily on the high awareness of the brand and logo.
- No quantifiable information provided to building owner.
- No differentiation between high impact and low impact projects.
- Lower value to market due to wide array of impacts and buildings that the same mark is applied to.
- No route to building improvement (although could be supplemented by a building report).

Option 2: A Building Based Quality Standard and Label

Description: A Building Quality Standard verifies that a building has met a pre-determined level of performance or quality. It is often binary (buildings have either met the standard or not), typically used to represent the highest performing examples within a population, but could easily be expanded to include gold, silver or bronze standards.

Examples of existing building quality marks include:

Home Quality Mark (BRE)	Certified Passive House
HOME QUALITY MARK delivered by bre	Certified Passive House Passive House Institute
The Home Quality Mark (HQM) helps house builders to demonstrate the high quality of their homes and to differentiate them in the marketplace. At the same time, it gives householders the confidence that the new homes they are choosing to buy or rent are well designed and built, and cost effective to run.	All proposed Passivhaus designs must undergo energy modelling conducted via the Passivhaus Planning Package (PHPP.) Tests ensure these targets are met, completing the quality assurance process. A certificate is only issued if the exactly defined criteria have been met without exception.

Process

Pros:

- Comprehensive, often covering multiple aspects of building performance and energy performance in holistic way.
- Easy to understand, without technical understanding.
- Rewards high performance rather than just progress. Attainment demonstrates high achievement and therefore the mark has genuine value.

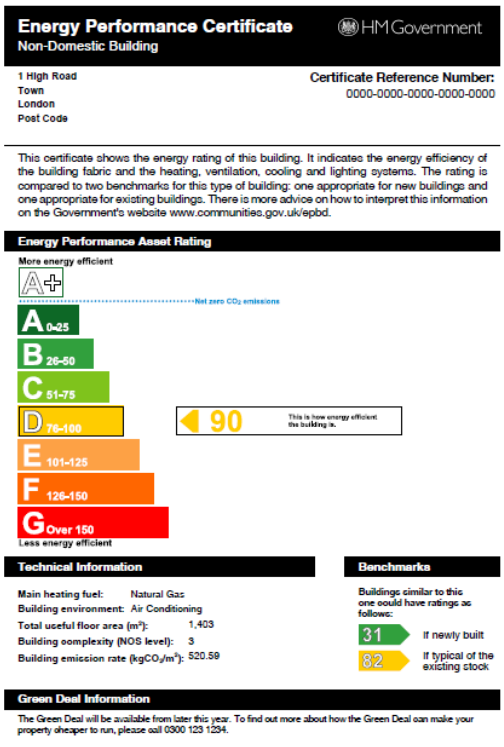
Cons:

- Binary (Although could be expanded to include Gold, Silver and Bronze).
- Difficult to achieve and doesn't reward smaller progress toward the target.
- Value to market depends on ubiquity and recognition and robustness of target.

Option 3: A Building Performance Certificate

A building Performance Certificate provides information on the energy performance of a building relative to a benchmark. Energy Performance Certificates in the EU typically provide an indication of

the building ‘potential’ i.e. how the building could perform after improvements are undertaken. The rating is typically linked to a consumer relevant metric (e.g. fuel cost).

EU Energy Performance Certificates	Indian Residential Building Energy Label
	
The UK Non-Domestic EPC provides an Energy Performance Rating from A – G. It also provides key technical information on Energy Use Intensity and floor area. The EPC benchmarks the building performance against typical buildings in the stock and against newly built buildings of the same type. Valid for 10 years	Based primarily on remote inspection of self-reported data. Site inspections for a proportion of buildings. Uses Energy Use Intensity bandings to calculate star ratings, differentiated by climatic zones. Takes account of both heating and cooling demand. Apply online. Building plaque, letter and email issued. Valid for 3 – 5 years

Process

Pros:

- Comprehensive, covering building energy performance in a holistic way.
- Provides valuable quantified information for the market, e.g. predicted fuel bills and CO_2 emissions.
- Provides a guide to potential performance, incentivising further progress.
- Provides a routemap to making further progress and quantifies the benefits (when accompanies by a retrofit plan).

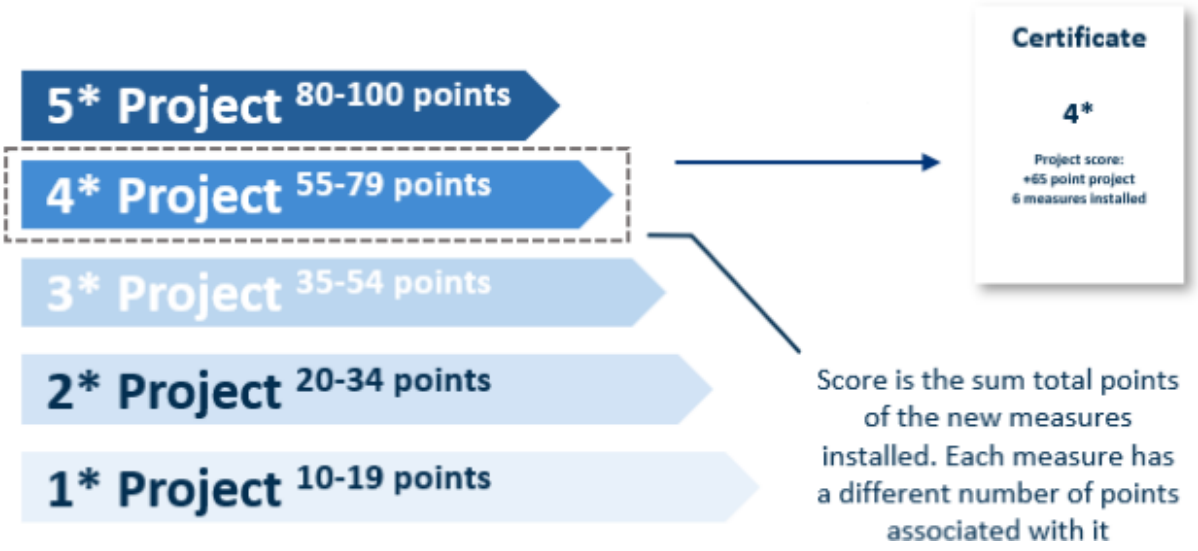
Cons:

- Highlights poor performing buildings as well as high performance buildings. This damages in the incentive for inefficient buildings to engage in a non-mandatory scheme.
- Relatively complicated and requires more understanding on the part of the building owner to interpret.
- Higher margin for error. Value depends on the accuracy and trustworthiness of the methodology.
- Does not reward smaller actions well – small actions may not make a difference to the overall rating.
- Unless the scheme becomes mandatory there is little basis for comparison to benchmark buildings – the value of high bands may not be understood in the market.

Option 4: A Project Impact Certificate

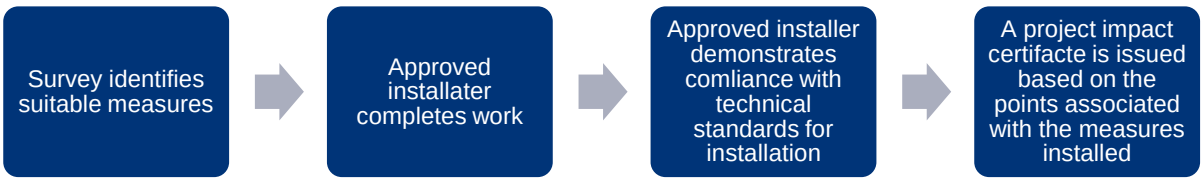
A Project Performance Certificate would provide a rating based solely on the impact of the retrofit project undertaken. In one potential model, each different retrofit measure could be assigned score, with the total number of points then added together and reflected in a banded rating system. For

example:



Under this scheme, any financial incentives could be associated with the rating achieved. For example, preferential loan rates or additional grant funding could be made available to 5* projects.

Process



Pros:

- Rewards the most ambitious projects with the highest ratings – incentivises deeper retrofit and greater impact.
- The highest ratings are only available to the worst performing buildings, incentivising them to take more action.
- Provides a clear route to achieving exemplary performance by identifying the measures required for best practice.

Cons:

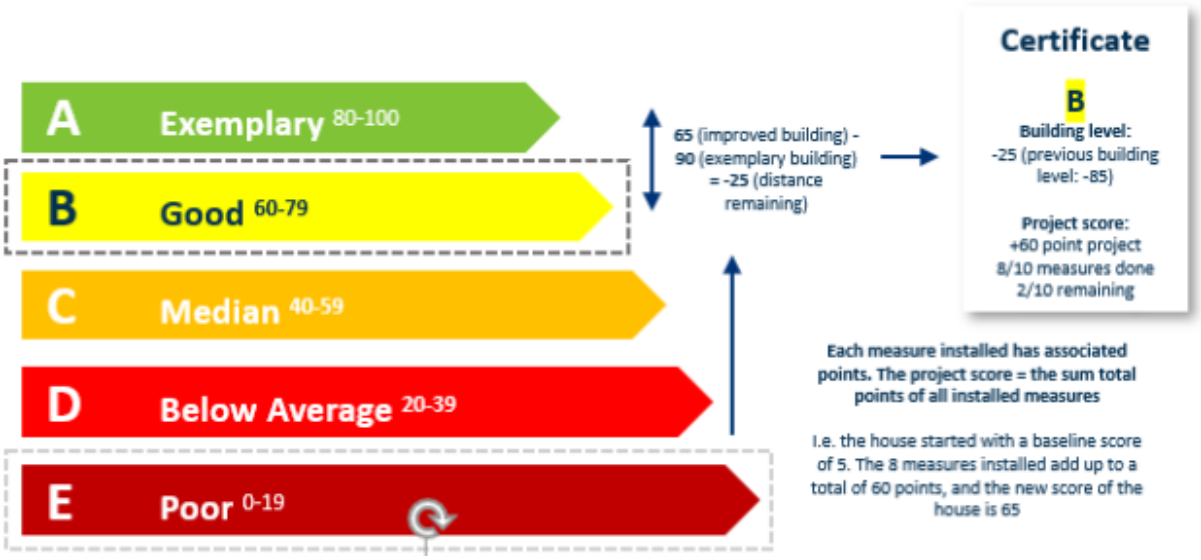
- Less valuable to the market as it does not provide the most relevant consumer information (eg predicted fuel bills or CO_2 emissions.
- Acts as a poor basis for cross building comparison
- An approach based on lists of measures may not be robust enough to deliver the best building assessments and identification of appropriate measures. Measures will perform differently in each building type and a more detailed assessment of Energy use is required to identify how the measures will perform in each dwelling. This approach could incentivise the sub-optimal retrofit approaches for some dwellings.

Option 5: Combined Building and Project Performance Certificate

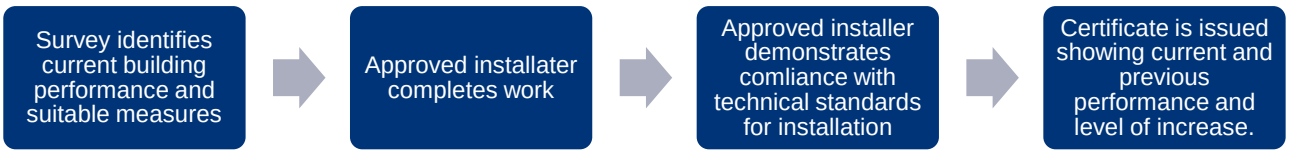
Combining both a building rating and project impact in one certificate was considered as an option to combine the best of options 3 and 4. In this certificate, both the previous and the post-retrofit performance of the building would be clearly highlighted on the certificate. The certificate would therefore demonstrate the current performance, plus the positive impact on energy rating that the retrofit project has made.

In this example, we have assumed a methodology where an ideal 'exemplary' building is defined for each major archetype in the stock. Buildings undergoing certification would then be assessed against this ideal case.

Because both the new performance level and the level of performance increase is identified, either or both could be used as the basis of preferential incentives. For example, additional grant could be made available to projects making the biggest improvement and / or projects achieving the highest ratings (A /& B).



Process



Pros:

- Provides the most valuable information for prospective homeowners (e.g. fuel bills)
- Rewards actions
- An excellent basis for providing differential incentives (e.g. grants or low interest loans) based on a combination of end-result energy use and the level of improvement.
- Incentivises more ambitious projects as they achieved the overall highest ratings.
- Incentivises action from poor performing homes as they can demonstrate improvement over baseline.

Cons:

- Relatively complicated to understand – attempting to convey a lot of information in one certificate
- Relatively costly to implement with a comprehensive audit of the property required.
- Highlights poorly performing properties – so less incentive for these properties to participate. However, they also have the greatest potential to demonstrate improvement.

Appendix 4: 'Next Generation' Innovative Initiatives

Vilawatt - *Innovative local public-private-citizen partnership for energy governance*

The project has set up a public-private-citizen partnership (PPCP), as the main governance structure to manage the 4 key services (collective energy buying, consulting services, building retrofit and Vilawatt currency) created to support the energy transition of Viladecans. Focusing in on the latter two:

- **Energy retrofitting** in Viladecans has not progressed as planned, partly due to lack of private investment. Most of its dwellings were built before 1976, when Spain began to adopt energy legislation. The project injects €1.4m in the energy renovation of 3 demo-buildings, that will be monitored.
- **A newly created local electronic currency**, the Vilawatt, provides efficiency incentives for participating families, who recieve the currency in return for any savings they make. This encourages loyalty to local shops where purchases can be made with the Vilawatt.

Energiesprong - *Innovative business model to deliver rapid whole-house retrofit using pre-fabricated measures*

- Energiesprong retrofits make a home net-zero energy, meaning it generates the total amount of energy required for its heating, hot water and electrical appliances.
- This is achieved by using new technologies such as prefabricated facades, insulated rooftops with solar panels, smart heating, and ventilation and cooling installations.
- Due to the use of pre-fab, installations are completed <10 days, and some in just 1 day.
- Refurbishments come with performance warranty on climate and energy performance for up to 40 years.
- Energiesprong retrofit is financed by future energy cost savings plus the budget for planned maintenance and repairs over the coming 30 years.
- In the case of housing associations, tenants pay the housing association an 'energy service plan' or 'comfort plan' which is the equivalent of their previous energy supplier bill. The housing association can use this new income stream to partly fund the renovation works.

Carrot Rewards - *Mobile app to deliver energy efficiency rewards*

- Objective: Engaging Canadians on their smartphones and gamifying learning and action will improve awareness and adoption of energy-efficient behaviours.
- Office of Energy Efficiency (OEE) program evaluation in 2015 recommended that OEE do a better job communicating and demonstrating the value of its energy efficiency tools and services, such as ENERGY STAR and EnerGuide.
- Carrot Rewards app:
    - **AI-driven public engagement platform** that leverages behavioural economics and nudge theory to motivate Canadians to make better everyday lifestyle choices.
    - **Leverages the power of popular consumer loyalty programs** in Canada to maximize its appeal and user engagement. Carrot users earn their choice of Aeroplan® Miles, SCENE®Points, Petro-Points™, More Rewards® Points, Drop points or RBC Rewards each time they interact with the app.

Citizen-centred Collaboration for Energy Efficiency

- With approximately 6 percent of homes in the City of Edmonton, Canada, having energy labels, this project set out to understand: *'how might we improve the residential labelling and reporting service experience and uptake to improve energy efficiency in homes?'*
- The project used citizen-centred design methods and approaches focusing on:
  - Energy efficiency behaviours and motivations of homeowners;
  - EnerGuide (Federal labelling and reporting tool) service and tools: home energy evaluation, labelling, and the renovation (aka retrofit) process; and
  - Behavioural aspects of message framing.
- Prototypes were co-designed and tested, including:
  - **Messaging** - Alternative messaging and framing through brochures or Google Ads;
  - **Energy Efficiency Block Party** - Working with neighbourhoods or community leagues to raise energy literacy and awareness; and
  - **The EnerGuide Report** - Redesigned EnerGuide report to address issues identified in co-design workshops.

SIMPLEX - *Simplification and modernization program focused on improving public service efficiency*

- The central policy program in Portugal to boost the public services reform and facilitate the relationship between the citizens and the enterprises with the public administration.
- The program is highly participative, with a strong focus on co-creation and the participation of different stakeholders in the process of defining the initiatives to be implemented by the government agencies.
- Combines in a single governmental program the objectives of better regulation; reduction of the administrative burden; interoperability; forms and procedures dematerialization; easy access to public services; cutting red tape; and the promotion of e-Government.
- Some of the most key initiatives that have happened under SIMPLEX are:
  - The "Born a Citizen", that enables birth registration at the maternity unities or hospitals (2007);
  - The "Automatic Tax Declaration", which made tax returns completely digital and automatic (2017);
  - The "I lost my wallet" counter, a one-stop counter that helps the citizen renew most of its documents in case his wallet is lost or stolen (2004);
  - "On the Spot Firm", that allows registering a company in less than one hour (2006);
  - The "Electronic Vaccination Bulletin", which makes available online the information about vaccination, providing personal notifications about coming dates (2018).

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