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Towards a Dutch Building Renovation Passport

Data Needs and Expectations in Practice

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Abstract

Reaching the Dutch target of a zero-emission building stock by 2050 depends on deep, staged renovations across much of the residential stock, with the roughly 1.5 million dwellings still rated E, F, or G as the priority subset for acceleration to 2030. Each stage of such a renovation is typically carried out by a different professional, years apart, so the building data generated in one stage is the input the next professional needs. In current Dutch practice, this data exists but does not cross professional or institutional boundaries. Contractors, advisors, municipalities, and homeowners each capture parts of it, and the records do not flow between them. The Dutch Building Renovation Passport (*gebouwrenovatiepaspoort*, BRP), available from May 29, 2026, is the policy response. It applies the *renovatiepaspoort* designation to the existing voluntary energy-renovation advice (*maatwerkadvies*) when the proposed pathway brings the building to the zero-emission standard. The launching scheme implements one half of what the recast EPBD calls a BRP, namely the stepwise renovation roadmap. The dossier half, a repository of building data sitting underneath that roadmap and remaining current across the 15- to 20-year staged horizon, is left to the broader Dutch building-data infrastructure to develop.

The building-data needs of the practitioners who would author and read such a Dutch BRP have not been documented empirically. This thesis maps those needs and elicits the practical expectations and concerns these practitioners would raise about a future Dutch BRP. The research is exploratory, centred on 15 semi-structured interviews with 17 respondents from the Dutch residential renovation sector, analysed thematically.

First, the canonical Dutch stakeholder taxonomy underrepresents the field. The interviews identify a wider intermediary class that shapes how data is captured and how advice is given, in ways the canonical taxonomy does not capture. Second, the same data fields are needed by different stakeholders at different levels of detail, with no current mechanism to deliver one field at multiple resolutions. What divides practitioners is not which fields they want (they often want the same ones) but the level of detail they need. Third, the dominant expectation is integration over replacement. Practitioners ask for an API on top of the systems they already run, and for national uniformity of minimum requirements. They do not want a new central silo stacked onto an already fragmented field.

Across the interviews, the renovation history recurs as the one category of building data that is universally needed yet universally inaccessible across actors. The renovation-history gap is the single most directly addressable item on the dossier side of any next iteration of the Dutch BRP. It is also the obvious place to link the BRP to the planned national federated building-data infrastructure (*Landelijke Voorziening Gebouwgegevens*, LVG). Whether subsequent iterations of the BRP deliver added value will depend on one design choice: building them around a dwelling-level dossier in which renovation-relevant data accumulates, stays current, and is accessible through one route.

Keywords: *Building Renovation Passport, Digital Building Logbook, EPBD, Dutch residential renovation, energy-renovation advice, building-data needs, renovation history, owner-occupiers.*

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Daan Schlosser
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Contents

List of abbreviations

Abbreviation	Expansion
3DBAG	3D *Basisregistratie Adressen en Gebouwen* (3D version of the BAG)
AFM	*Autoriteit Financiële Markten* (Dutch Authority for the Financial Markets)
API	Application Programming Interface
BAG	*Basisregistratie Adressen en Gebouwen* (Key Register of Addresses and Buildings)
BIM	Building Information Modelling
BPIE	Buildings Performance Institute Europe
BRP	Building Renovation Passport
BZK	*Ministerie van Binnenlandse Zaken en Koninkrijksrelaties* (Ministry of the Interior and Kingdom Relations)
CBS	*Centraal Bureau voor de Statistiek* (Statistics Netherlands)
CityGML	City Geography Markup Language
DBL	Digital Building Logbook
DIY	Do It Yourself
DSGO	*Digitaal Stelsel Gebouwde Omgeving* (Digital Framework for the Built Environment)
EASME	Executive Agency for Small and Medium-sized Enterprises (European Commission)
EPBD	Energy Performance of Buildings Directive
EPA	Energy Performance Advice
EPC	Energy Performance Certificate
ERP	Enterprise Resource Planning
EU	European Union
GBEA	*Gebiedsgerichte Bestrijding van Energiearmoede* (area-based energy-poverty programme)
ISDE	*Investeringssubsidie duurzame energie en energiebesparing* (investment subsidy for sustainable energy and energy saving, administered by RVO)
LVG	*Landelijke Voorziening Gebouwgegevens* (National Building-Data Service)
MSRD	Minimum Set of Required Data
MVP	Minimum Viable Product
NPLW	*Nationaal Programma Lokale Warmtetransitie* (National Programme for Local Heat Transition)
NTA	*Nederlandse Technische Afspraak* (Dutch Technical Agreement, as in NTA 8800)
OSS	One-stop shop
PDOK	*Publieke Dienstverlening Op de Kaart* (Public Services on the Map)
RVO	*Rijksdienst voor Ondernemend Nederland* (Dutch Enterprise Agency)
SEEH	*Subsidie energiebesparing eigen huis* (own-home energy-saving subsidy)
SPUK	*Specifieke Uitkering* (specific-purpose central-government grant to municipalities)
TNO	*Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek* (Dutch Organisation for Applied Scientific Research)
VRO	*Ministerie van Volkshuisvesting en Ruimtelijke Ordening* (Ministry of Housing and Spatial Planning)
WOZ	*Wet waardering onroerende zaken* (Property Valuation Act; the resulting WOZ-*waarde* is the official assessed value used for property taxation)
ZEB	Zero-Emission Building

Table 1: Recurring abbreviations and acronyms used throughout this thesis. Italics denote Dutch-language terms.

Glossary of Dutch terms

Dutch term	**English translation and/or explanation**
Aardgasvrij	Natural-gas-free
BAG-*pand* / -*verblijfsobject*	BAG premises / residence-object
Emissievrij gebouw	Zero-emission building (ZEB)
Energieloket / *energieloketten*	Regional or municipal energy-advice counter(s)
EP-*adviseur* / EPA-*adviseur*	Energy-performance advisor
EP-Online	Dutch national EPC and energy-label register, operated by RVO
Federatief Datastelsel	Federated Data System (also FDS)
Fixbrigade	Fix-team (small physical-measures crew)
Gebouwrenovatiepaspoort	Dutch Building Renovation Passport
Grondgebonden woningen	Single-family / ground-level dwellings
Hoomdossier	Online home-sustainability dossier developed by *Coöperatie Hoom*, used by residents and energy coaches to plan renovations
Kadaster	Dutch Land Registry
Landelijke Voorziening	National service / facility
Maatwerkadvies / *maatwerkadviseur*	Tailor-made renovation advice / advisor
MijnOverheid	Dutch government's citizen-facing personal portal
Monumentstatus / *welstand*	Monument status / aesthetic-quality requirement
Ontzorging / *ontzorgingsconcepten*	End-to-end relief / relief concepts
Renovatiepaspoort	Renovation passport
Rijksoverheid	National government
Tam-tam fase	Rumour-mill phase
Trias Energetica	3-step Dutch energy-efficient design strategy
VerbeterJeHuis(.nl)	Public Dutch home-improvement portal
Verduurzaamd Wonen	Commercial Dutch one-stop-shop renovation brand
Warmtefonds	Heat Fund (national renovation-loan fund)
Wet kwaliteitsborging voor het bouwen	Building Quality Assurance Act (abbreviated Wkb)
Woningdossier	Housing Dossier (Dutch consumer dwelling-data tool)

Table 2: Recurring Dutch terms with English translations and, where appropriate, brief contextual notes. Italics denote Dutch-language terms; for institutional acronyms, see Table 1.

1. Introduction

1.1. The Dutch renovation challenge

The Netherlands faces a large and time-pressured renovation challenge. Around 1.5 million Dutch dwellings still carry poor energy labels of E, F, or G, and in mid-2022, more than 90% of homes were still heated with natural gas or other fossil fuels [1]. That share has moved only modestly since: by 2024 only 11.2% of dwellings had been converted to gas-free heating, up from 8.7% two years earlier [2]. At roughly 1.25 percentage points per year, this conversion pace is on the same order as the European Union (EU)-wide renovation rate of about 1.2% per year. In Fabbri et al. [3], this rate is estimated at roughly half of the 2% to 3% per year considered necessary to meet climate objectives.

The Dutch Climate Act (*Klimaatwet*), as amended in 2023 to align with Article 2(1) of the European Climate Law [4], now commits the Netherlands to reducing net greenhouse-gas emissions to zero by 2050, with an intermediate target of a 55% reduction relative to 1990 by 2030 [5]. The 2019 Climate Agreement (*Klimaatakkoord*) had earlier translated the original Climate Act targets into a concrete objective for the built environment: transforming the roughly seven million homes and one million other buildings then heated with natural gas into well-insulated, largely fossil-free buildings by 2050, step by step and together with residents and owners [6].

The terminology used to describe the policy target has evolved over the past decade. The Dutch 2019 Climate Agreement framed the end goal as disconnecting buildings from natural gas (*aardgasvrij*), whereas both Dutch and EU policy have since shifted to the broader Zero-Emission Buildings (ZEB) framing codified in the recast Energy Performance of Buildings Directive (EPBD IV) [7]. This thesis adopts *zero-emission* consistent with the EPBD recast framing, while much of the Dutch literature still uses the earlier *aardgasvrij* or *fossil-fuel-free* terminology.

For most homeowners, reaching the zero-emission standard is not a single intervention but a sequence. A typical trajectory involves replacing a gas boiler with a heat pump or connecting to low-temperature district heating. Both options require a low supply temperature to operate efficiently. Hence, insulation upgrades and radiator or underfloor-heating replacements often have to precede or accompany the heating-system change [8]. Each measure is typically contracted out to a different specialist, often years apart, and a separate subsidy regime, permit requirement, or warranty accompanies each. This staged nature is the feature that makes building-data provision a practical bottleneck rather than a paperwork concern, and motivates the introduction of building-data instruments discussed in the next sections.

1.2. Limitations of existing tools

The main instrument that currently discloses a Dutch home's energy performance is the Energy Performance Certificate (EPC), introduced through the EU EPBD in 2002 [9]. An EPC is a standardised certificate that classifies a building's expected energy performance on a comparable scale, with the stated purpose of informing buyers and tenants about that performance and supporting comparison across the housing stock [10]. In the Netherlands, the EPC is issued as a label on a scale from A++++ (most efficient) to G (least efficient) and is compulsory at the moment of sale, letting, or delivery of a dwelling [10].

An EPC may only be issued by a licensed Energy-Performance advisor (EP-*adviseur*), a certified professional who carries out an on-site inspection and records the dwelling's geometry, envelope construction, and installations [10]. These recorded characteristics are then used in the prescribed *Nederlandse Technische Afspraak* (NTA) 8800 calculation methodology (which replaced NEN 7120 on January 1, 2021), which combines them with standardised assumptions about occupant behaviour and climate to compute the building's predicted primary fossil-energy use in kWh/m^2/year. This value is then translated into the A++++ to G label.

However, as a renovation handbook, the EPC has important limitations. The certificate is a model-based snapshot of the current energy performance and does not track changes over time. While the recast EPBD requires EPCs to include recommendations for cost-effective or cost-optimal improvements (Art. 19(5)) [7], those recommendations remain generic, are not delivered as a sequenced roadmap, and do not capture the information dependencies between successive measures. As a result, the certificate leaves open the question of what to do to improve the building: which measures, in which order, and with which information dependencies between them [3, 11].

1.3. Digital Building Logbooks and Building Renovation Passports

In response to these limitations, and to bridge the information gaps across the renovation journey, the EU has introduced two complementary instruments, the Digital Building Logbook (DBL) and the Building Renovation Passport (BRP).

A DBL is a common repository for all relevant building data throughout a building's life cycle, including its energy performance certificate, BRP, smart-readiness indicator (SRI), and lifecycle global warming potential data [7, 12]. Its stated aim is to facilitate transparency, trust, informed decision-making, and information sharing across the parties involved in a building's life cycle: the construction sector, building owners and occupants, financial institutions, and public authorities [12]. DBLs were introduced in 2020 within the EU Renovation Wave Strategy [13] and given a formal definition in the 2024 EPBD recast (Art. 2(41)) [7]. A BRP, in turn, is a tailored roadmap for the deep renovation of a specific building in a maximum number of steps (Art. 2(19)). Its purpose is to support staged deep renovations, by building upon the data provided by DBLs. BRPs were introduced in 2024 through the EPBD recast (Directive (EU) 2024/1275, Article 12) as a voluntary scheme that Member States must make available by May 29, 2026 and may also make mandatory at the national level [7].

Annex VIII of the directive sets out the common framework for the content of a BRP. Its mandatory elements (Annex VIII §1) can be grouped as follows:

- the building's current energy performance and the applicable national renovation requirements (e.g. minimum energy-performance standards and fossil-fuel phase-out rules);
- a graphical, staged renovation roadmap with a succinct explanation of the optimal sequencing of steps;
- per-step estimates of energy savings, operational greenhouse-gas reduction, energy-bill savings, and the resulting energy-performance class;
- the share of renewable energy generated and self-consumed achievable after renovation, including potential connections to efficient district heating and cooling;
- wider information on construction-product circularity, whole-life-cycle emissions, and benefits related to health, comfort, indoor environmental quality, and the building's climate-adaptive capacity; and
- pointers to applicable financial support and one-stop-shop advisory services.

The DBL and the BRP are designed to complement, not replace, the EPC. The EPC remains the mandatory regulatory snapshot of a building's current energy performance, issued at construction, sale, letting, or major renovation, with a maximum validity of 10 years (Art. 20(1) and 19(13)) [7]. The DBL extends this by holding EPCs, BRPs, and smart-readiness data in a single repository across the building's life cycle, addressing the EPC's lack of continuity over time. The BRP extends it forward in time, translating the EPC's static performance into a sequenced, customised renovation pathway with information dependencies between successive stages made explicit, addressing the EPC's lack of a roadmap. The EPBD ties the three instruments together explicitly. First, a BRP must consider the EPC's information as its starting point (Annex VIII §3). Second, it can be issued jointly with the EPC and, when so issued, substitutes the EPC's standalone renovation recommendations (Art. 19(6)). Third, it is to be stored in or accessible via the DBL where one is available (Art. 12(8)). The added value of combining the three instruments is therefore not a new certificate but a continuous record of building information that supports decisions across the multi-year, multi-stage renovation journey the EPC alone cannot describe.

This thesis focuses on the BRP, the instrument through which the Dutch government intends to deliver step-by-step renovation roadmaps to owner-occupiers. The BRP cannot, however, be scoped in isolation from the DBL. The EPBD positions a BRP as drawing on the building data a DBL is meant to hold, and the two instruments are defined inconsistently across the literature (Section 2.1.2). The literature review therefore treats DBL and BRP together where their concepts depend on each other, while the research question, the empirical work, and the adopted definition focus on the BRP.

1.3.1. The Dutch implementation: *gebouwrenovatiepaspoort*

The Dutch government is already acting on development of the BRP. The national Dutch BRP scheme (the *gebouwrenovatiepaspoort*, hereafter referred to as the Dutch BRP) becomes available on May 29, 2026, led by the *Ministerie van Binnenlandse Zaken en Koninkrijksrelaties* (BZK, Ministry of the Interior and Kingdom Relations) with the *Rijksdienst voor Ondernemend Nederland* (RVO, Netherlands Enterprise Agency) as implementing body [14, 15]. Rather than introducing a completely new instrument, the Dutch BRP builds on the existing *maatwerkadvies*, a voluntary, building-specific energy-renovation advice that supplements the mandatory Dutch EPC. When a *maatwerkadviseur* (a licensed Energy Performance (EP)-advisor) proposes a renovation pathway that brings the building to an *emissievrij gebouw* (emission-free building, defined in practice as sufficiently insulated and natural gas-free), the *maatwerkadvies* receives the *renovatiepaspoort* label [14, 16].

The scale of the task that this instrument has to support is large. The 2030 Dutch vision commits to insulating 2.5 million homes, installing 1 million hybrid heat pumps in the existing stock, and realising 500,000 new connections to district-heat networks [1]. Reaching these targets in practice almost always requires a staged renovation, with stages carried out in sequence, for example, insulation before a low-temperature heating system is installed. Each stage is typically carried out by a different professional, often years apart, so long-term coordination and information transfer between them is essential.

In current practice, this coordination is where things often break down. Dutch renovation advice is already spread across a large number of platforms and providers [17], and advice to homeowners is often conflicting because each professional is an expert only in their own domain, but lacks knowledge of work outside their specialism [18–20]. In addition, coordination and communication between stakeholders across the successive stages of a renovation are themselves reported as bottlenecks [21]. In a staged renovation, the information generated during one stage is the input the next professional needs years later. Examples include measured U-values, as-built drawings, installed-system datasheets, and decisions made together with the reasoning behind them. The absence of a continuous record of what has been done and what is yet to be done leaves each subsequent advisor to reconstruct the building's history from scratch. Poor early decisions can also complicate or even block later stages, a lock-in risk that renovation-passport schemes are designed to avoid [3, 22].

The stakeholder roles around a Dutch BRP fall into three groups that are not always distinguished in the EU-level literature. The first is the professional who issues it. In the Netherlands, the BRP is the *maatwerkadvies* that a *maatwerkadviseur* writes after an on-site assessment, and on which RVO places the *renovatiepaspoort* label once the proposed pathway reaches an *emissievrij gebouw* end state [14]. The advisor visit is therefore not replaced by the BRP; the BRP is the advisor's deliverable, written in a regulated format. The second group is the homeowner, who commissions the BRP and decides which staged measures to act on and when to act on them. The third group is the chain of subsequent professionals who interact with the BRP over the 15-to-20-year staged horizon. Contractors and installers execute each stage; one-stop shops and energy coaches orient the homeowner around the roadmap; and any later *maatwerkadviseur* revises the document once the stages have been completed or a new measure is being considered. These three groups have systematically different relationships to the same document. The first authors it from upstream building data, the second decides on its content, and the third reads it from downstream as input to their own next intervention. Their data needs are accordingly not the same.

1.3.2. The Dutch data infrastructure: *Landelijke Voorziening Gebouwgegevens*

The Dutch BRP addresses the EPBD recast's requirement for a BRP, but does not, on its own, address issues such as where the underlying building data reside, how they remain consistent across a building's life cycle, or how they reach the parties who write and use renovation roadmaps. That is the question a DBL is intended to answer at the EU level. The Dutch government's emerging response on the data side is the *Landelijke Voorziening Gebouwgegevens* (LVG), a federated infrastructure proposed by BZK and scoped in a July 2024 *verkenning*[1] conducted by the Kadaster [23]. The LVG is planned around a Minimum Viable Product (MVP) plus a longer-term roadmap; its definition, sources, and the gaps relevant to a Dutch BRP are reviewed in Section 2.1.3.

The gap relevant to this thesis is that the LVG MVP, as currently planned, does not yet hold the renovation-history, envelope-detail, and post-renovation-performance data that a step-by-step renovation roadmap depends on across multiple stages and years (Section 2.1.3). In current Dutch practice, those data sit dispersed across professional records, paper archives, on-site surveys, and personal communication between successive advisors. This raises two empirical questions for this thesis. The first is whether the LVG's planned scope is sufficient for the data needs of the Dutch professionals who would generate or deliver a Dutch BRP. The second is what those professionals themselves expect of a Dutch BRP that is supposed to draw on such an infrastructure.

[1] Dutch for 'scoping / exploratory study'. The document's full title is *Landelijke Voorziening Gebouwgegevens: Een verkenning ter ondersteuning van besluitvorming*. Hereafter translated as 'scoping study'.

1.4. Research gap

A large share of the Dutch residential stock will require deep, multi-step renovations before 2050, and the Dutch BRP positions a single document at the centre of that staged process (Section 1.3.1). Two practitioner-side empirical questions follow from its design.

The first concerns the professionals who *author* a Dutch BRP. The *maatwerkadviseur* is the role that the RVO scheme assigns to writing the staged roadmap [14], and the building data this role needs (which fields, at which level of detail, from which sources, and which of those sources are presently inaccessible) has not been documented empirically in the Dutch context.

The second concerns the professionals who *read* a Dutch BRP after it has been issued. Contractors and installers carry out each staged measure, one-stop shops and energy coaches orient the owner-occupier around the roadmap, and a subsequent *maatwerkadviseur* may revise it as stages are completed. What these reader-side professionals need to retrieve from a BRP to act coherently in the next stage, and what they would have wanted the author to have recorded, is likewise not mapped.

EU-level reviews of BRP and decision-support tooling have concentrated on policy and initiative-level comparison across Member States [3, 22], and practitioner-side evidence on information needs has been collected outside the Dutch context, e.g. in iBRoad[2] pilot countries (Bulgaria, Poland, Portugal) [24] and in the UK [19]. Dutch academic work on the data layer of a Dutch BRP has only just begun under the 2025 RenoDAT consortium, funded by the *Nederlandse Organisatie voor Wetenschappelijk Onderzoek* (NWO, Dutch Research Council) [25]. The available peer-reviewed Dutch evidence on renovation decision-making sits on the homeowner side rather than the practitioner side. Available studies examine how owner-occupiers navigate a fragmented set of digital renovation platforms [17], the questions homeowners raise when considering an energy retrofit [26], and specific technical pathways such as readiness for low-temperature district heating [8]. The practitioner information workflow that a Dutch BRP would have to serve, both writing it and reading it, is not addressed.

This leaves an explicit empirical gap: the building-data needs of the professionals who would author a Dutch BRP, and of the professionals who would later read one to act on its stages, together with their practical expectations of the instrument itself.

1.5. Objective and motivation

The objective of this research is to identify the building-data needs of the stakeholders who advise Dutch homeowners, specifically owner-occupiers, on energy renovation, and to elicit the practical expectations and concerns these stakeholders would have of a national Dutch BRP.

The expected output is twofold: (i) a practitioner-grounded account of what building data Dutch renovation advisors actually require, at what level of detail, and from which sources they currently obtain it; and (ii) a set of practical expectations, concerns, and missing elements that these professionals would raise in relation to a hypothetical Dutch BRP. Together, these findings are intended to inform the ongoing development of the Dutch BRP and the next iteration of any underlying data model.

[2]iBRoad (2017-2020) was an EU Horizon 2020 research and pilot project that developed the concept of an *Individual Building Renovation Roadmap*, as a research initiative, for single-family and small multifamily houses, consisting of a 10-20 year step-by-step renovation plan (iBRoad-Plan) paired with a building logbook (iBRoad-Log). It delivered concept work and user-needs surveys in its pilot countries.

1.6. Research questions

Building on the gap identified in Section 1.4 and the objective stated in Section 1.5, the research is guided by one main question and three sub-questions. The sub-questions are designed to be answered in sequence: SQ1 identifies the relevant stakeholders, SQ2 elicits their data needs, and SQ3 identifies the expectations and concerns a Dutch BRP would need to address.

Main research question

What are the building-data needs of the stakeholders involved in providing renovation advice to Dutch owner-occupiers towards an emission-free home, and what practical expectations do these stakeholders have of a Dutch BRP?

Sub-questions

1. Who are the stakeholders that play a role in providing renovation advice to Dutch owner-occupiers, and what are their roles in the advisory process?
2. What building data do these stakeholders require to provide informed renovation advice, and at what level of detail?
3. What practical expectations, concerns, and missing elements emerge regarding a Dutch BRP?

1.7. Scope

This research focuses on the Dutch residential renovation context, specifically on how owner-occupiers of single-family dwellings (*grondgebonden woningen*) are advised on energy-efficient renovations towards the zero-emission standard.

Single-family dwellings (*grondgebonden woningen*, including terraced, detached, and semi-detached homes) account for roughly 63% of the Dutch residential stock, about 5.24 million of the 8.34 million dwellings, as recorded on January 1, 2026 [27]. Around three-quarters of these single-family dwellings are owner-occupied, corresponding to close to 48% of the total housing stock [28]. Within this owner-occupier segment, approximately 900,000 dwellings still carry poor energy labels of E, F, or G, and are a primary target of the national renovation programme for acceleration to 2030 [1]. The focus is placed on this group for three reasons. First, its size means that progress on residential decarbonisation depends disproportionately on its renovation decisions. Second, unlike housing corporations or professional landlords, owner-occupiers lack in-house professional expertise and must rely on external advisors for virtually every step of a renovation. Third, this combination makes them the group on which Dutch and EU renovation policy most concretely hinges: reaching the 2030 Dutch vision and the 2050 zero-emission target depends on equipping this group, and its advisors, with better information.

This thesis does not focus on the ways to incentivise renovation, but on the building data itself: specifically *what* data is needed, *by whom*, and at *what level of detail*. It does not address how that data should be visualised, nor the technical methodologies through which energy performance is calculated.

1.8. Relevance

1.8.1. Scientific contribution

Existing empirical evidence on residential renovation has focused on owner-occupier behaviour, EU-level policy and initiative comparisons, and practitioner-side studies conducted in countries other than the Netherlands (Section 1.4). The building-data needs of the Dutch professionals who would author and later read a Dutch BRP, and how those needs map onto a concrete data-model proposal, have not yet been documented.

The contribution this thesis expects to make sits along three lines.

The first is empirical. The interviews and the closing-block artefact elicitation described in Chapter 3 are designed to produce a practitioner-grounded account of those needs against the canonical Dutch literature reviewed in Chapter 2.

The second is structural. Reading data needs across stakeholder groups rather than within a single group is positioned to identify patterns in the Dutch building-data ecosystem that the literature has not named. Anticipated patterns include cross-actor accessibility gaps in renovation history, resolution mismatches in shared fields, and gaps between energetic advice and what can be carried out on a specific dwelling. Where they emerge, these are expected to travel beyond the Dutch case as design constraints on any staged BRP scheme.

The third is interpretive. The thesis is positioned to refine or qualify two recurring framings in the Dutch literature where the practitioner field is expected to report a different picture. These are the renovation-advice stakeholder taxonomy (Section 2.2.3) and the literature's treatment of privacy in the residential-renovation data setting.

1.8.2. Policy contribution

For policymakers at BZK, RVO, and the EU-level bodies implementing the EPBD recast, the contribution this thesis expects to make concerns the governance of the Dutch BRP rather than the data model that underpins it. The Dutch BRP is the *maatwerkadvies* stamped by RVO (Section 1.3.1) and is to be stored in or accessible via a DBL-track infrastructure such as the LVG (Section 1.3.2). A practitioner-grounded reading of how the document is authored, owned, and later read is expected to bring forward governance questions that the data-model debate cannot settle on its own.

Five such questions are anticipated. Data access and consent boundaries shift once professional-resident data moves to a public central register. National minimum requirements determine whether the BRP scales across municipalities and interoperates with the systems professional users already run. The executed-works layer that a staged BRP depends on presupposes recording standards that are not yet fully prescribed. The certification regime for the issuing *maatwerkadviseur* underwrites the credibility of the document. The allocation of liability between the parties writing and reading the document is what makes the staged handover legally workable. The thesis is positioned to inform policy choices on how, by whom, under what conditions, and at what cost the BRP's data flows are governed.

1.8.3. Societal contribution

The thesis is expected to document the gap between the data Dutch advisors currently have and the data they would need to support deep, multi-step renovations. Closure of that gap depends on subsequent iterations of the Dutch BRP. Where it is closed, better-aligned data would let professionals give more accurate, situation-specific advice, and let owner-occupiers make better-informed renovation decisions. The eventual contribution to residential decarbonisation is modest in scale and specific in form. It bears most directly on the roughly 900,000 owner-occupied dwellings still rated E, F, or G that the 2030 national programme and the 2050 zero-emission target depend on.

1.9. A parallel study: the Geomatics data-model thesis

This research is conducted alongside a parallel Geomatics MSc thesis at TU Delft. The two studies examine the same problem, data provision for a Dutch BRP, from different perspectives and with different outputs. The present thesis takes the practice perspective, while the Geomatics thesis takes the data-modelling perspective. The former identifies the building-data needs of Dutch renovation advisors and their expectations of a Dutch BRP; the latter synthesises a data-model proposal for a Dutch BRP and tests it on real building data. The two studies are linked through the use of the Geomatics data-model proposal as a concrete prompt during the interviews conducted in the present thesis. Together, they pair a data-model proposal with a practitioner-grounded view of that proposal.

In its current form, the Geomatics thesis proceeds along three streams. First, 14 existing and proposed DBL/BRP initiatives are reviewed, and a Minimum Set of Required Data (MSRD) is synthesised from them through explicit reasoning about each field's relevance for a Dutch BRP. The frequency of inclusion across the reviewed initiatives is used as a relativising signal rather than a hard rule. Second, this MSRD is mapped onto the City Geography Markup Language (CityGML) 2.0 + Energy ADE 3.0 data model and tested at audit-level depth on a single owner-occupier dwelling, with data collected specifically for that case. The aim is to assess whether the proposed data model is a meaningful starting point for storing the depth of information a full renovation-passport audit would produce. Third, the same data model is tested at city-stock breadth on an entire Dutch municipality, populated this time from open government sources (BAG, the 3D version of the BAG (3DBAG), EP-Online, *Centraal Bureau voor de Statistiek* (CBS, Statistics Netherlands) Postcode-6 statistics, and more). The aim is to assess whether it is a meaningful starting point for storing the building data that already exists in Dutch open data. The output is a field-level data-model proposal, grounded in existing EU initiatives and policy documents and paired with both a depth- and a breadth-test against real building data.

Each thesis stands on its own evidence, the Geomatics thesis on the two data-driven cases above and the present one on the practitioner interviews. The reactions captured in those interviews offer a complementary practitioner-side perspective on the data-model proposal. However, the Geomatics thesis validates its proposal through its own depth- and breadth-tests, not through these interviews. The relationship is set out in the methodology (Chapter 3).

2. Research Background

This chapter situates the thesis at the intersection of two bodies of literature: work on **building data** and its centralisation, and work on **building renovation** from the owner-occupier perspective. Figure 2.1 maps this structure.

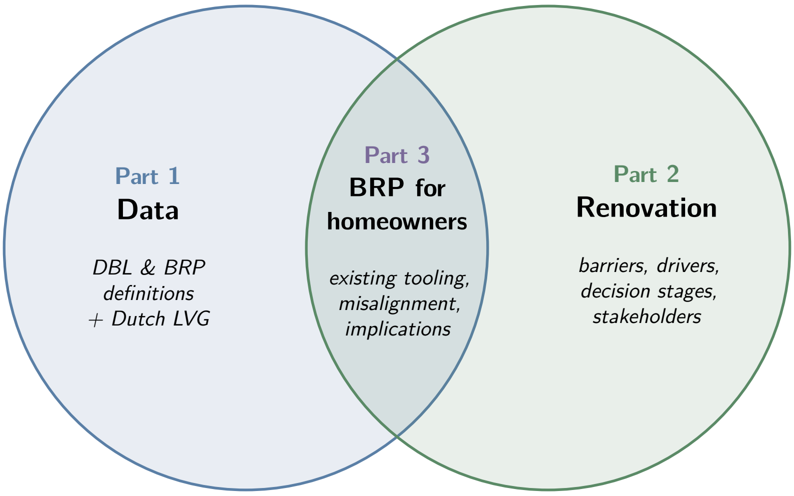


Figure 2.1: Chapter 2 sits at the intersection of two literatures: building data (Part 1) and building renovation (Part 2). The overlap (Part 3) is where the BRP for owner-occupiers lives. Own work.

Part 1 examines the data side, opening with the case for centralisation of data before setting out how DBLs and BRPs have been defined in the European literature. Part 2 shifts to the renovation side, reviewing what is known about how Dutch owner-occupiers reach renovation decisions, the barriers and drivers that shape them, and the stages at which those barriers arise. Part 3 draws the two strands together around the BRP for homeowners, weighing the presentation layer of existing BRP-style tooling against the drivers, barriers, decision-making stages, and stakeholder roles synthesised in Part 2.

2.1. Part 1. Data: the case for centralised building data

This part opens with the underlying problem (building data is fragmented, lost, and inconsistently recorded) and then introduces the two EU-level concepts proposed to address it, narrowing to the BRP as the object of study.

2.1.1. The case for digitalisation of building data

The preceding definitions establish *what* DBLs and BRPs are intended to be. This section addresses *why* the digitalisation of building data is considered necessary, drawing on the problems identified in the literature and reinforced by policy developments.

Information fragmentation in current renovation practice

The current state of building information in the Netherlands, and across Europe more broadly, is characterised by severe fragmentation. Building data is scattered across paper archives, municipal registers, EPC registers, advisor dossiers, contractor files, and homeowners' personal records [13, 21]. Each professional who engages with a building, whether an energy advisor, a contractor, or a municipal officer, typically starts their assessment with little to no access to what previous professionals have established. This means that data on the same building characteristics are repeatedly collected, sometimes through costly and time-consuming processes such as on-site inspections or even destructive research, despite having been assessed before [22].

This fragmentation has concrete consequences. EPCs, the most widely used standardised building-data source, are snapshots that quickly become outdated: they are typically registered at the point of sale, after which the new owner may renovate without updating the certificate [29]. Renovation history, which would be essential for understanding what has already been done to a building and what remains, is essentially absent from any structured data system. As a result, a contractor assessing a building for a subsequent renovation step has no systematic way of knowing what materials were previously installed, to what specifications, or by whom.

The value proposition of centralised, digital building data

The central argument for digitalising building data through instruments like DBLs and BRPs rests on three pillars:

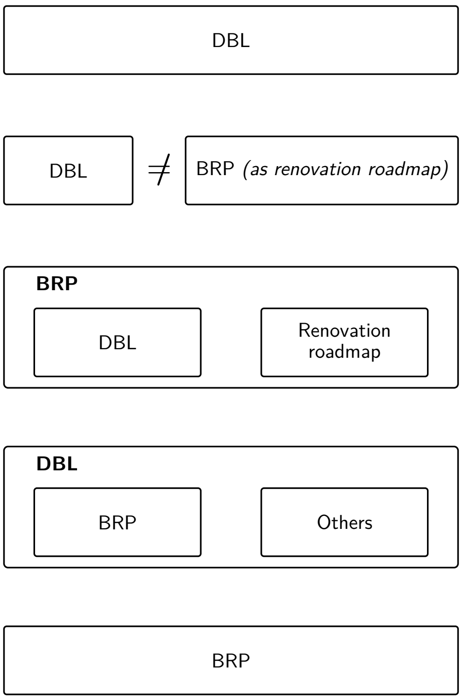
1. **Reducing repeated data collection.** If trustworthy building data were stored centrally and kept current, each stakeholder in the renovation chain could access what is already known rather than collecting it anew. This reduces costs, saves time, and avoids the loss of information that currently occurs between renovation steps [12].
2. **Enabling building-specific renovation advice.** A persistent, structured building data repository makes it possible to generate personalised renovation roadmaps based on the actual state of the building, rather than relying on generic assumptions derived from building period and typology alone [3, 22]. This directly addresses one of the key barriers identified in the literature: the lack of building-specific advice.
3. **Supporting informed decision-making at multiple levels.** Digitalised building data can serve different stakeholders at different levels of aggregation: individual homeowners can see the state of their own building and the potential of specific measures; municipalities can identify neighbourhoods with the greatest need or potential; and national agencies can monitor progress towards climate targets [13]. The same underlying data, structured appropriately, can thus support decisions from the individual to the policy level.

Data that may prove relevant in the future

An additional argument for storing a broad set of building data is that the relevance of certain building characteristics may only become apparent in hindsight. The clearest example in the Dutch building stock is asbestos. Between roughly 1945 and 1993, asbestos was extensively processed into construction products such as corrugated cement sheets, pipes, thermal insulation, and floor coverings, before its application was banned in the Netherlands in 1993 [30]. Although its health risks are now well established, no systematic record exists of where, in which buildings, and in which components it was installed. Its presence can therefore only be confirmed through physical inspection during renovation or demolition, and recent studies have had to resort to machine-learning models trained on pre-demolition audits to estimate the likely presence of asbestos and related legacy substances such as polychlorinated biphenyls in individual buildings [31, 32]. A structured building data system that captured applied materials at the time of installation would remove the need for such retrospective detection, and would reduce health risks for occupants and renovation workers in future renovation projects.

2.1.2. Definitions and interrelationships of DBLs and BRPs

The terms Digital Building Logbook (DBL) and Building Renovation Passport (BRP) are used across European policy and academic literature with varying, and sometimes conflicting, definitions. A further complication is the parallel use of "Building Passport" (BP) as a terminology variant for the DBL: sources that equate BP with DBL are not equating the BRP with the DBL, despite the partial overlap in the names. The following sections classify the reviewed literature into five categories, illustrated in Figure 2.2, based on how each source positions the two concepts and their interrelationship. This classification reveals that the conceptual confusion is not incidental but structural: the field has evolved from treating BRPs as the primary instrument (in early research projects) to positioning DBLs as the overarching repository (in recent EU policy), without reaching a consensus.



A. Only uses the term Digital Building Logbook (or Building Logbook); does not engage with the BRP concept.

B. Treats the DBL and the BRP as separate, complementary tools, often following the EPBD IV definitions; the BRP is essentially a renovation roadmap.

C. Positions the BRP as the overarching tool, composed of two parts: a logbook (DBL) and a renovation roadmap.

D. Positions the DBL as the overarching repository within which BRPs are stored or accessible, alongside other building data.

E. Discusses only the BRP and does not engage with the DBL concept.

Figure 2.2: Five identified categories of how the literature positions the relationship between DBLs and BRPs. Categories C and D reflect a chronological shift, from BRP-as-overarching (early research projects, e.g. the Individual Building Renovation Roadmaps (iBRoad) and ALliance for Deep RENovation in buildings (ALDREN) projects) to DBL-as-overarching (recent EU policy framing). Own work.

A: Sources discussing only the concept of DBLs

In Toth et al. [33], a mini-report from the X-tendo project (Extending the energy-performance certificate; EU Horizon 2020, 2018-2021), BRPs appear as one of six tiles labelled as data inputs to the DBL, alongside the EPC, the land registry, financial data, the Smart Readiness Indicator, and links to one-stop shops and third parties; the BRP is shown only on the cover diagram, with no textual definition of what it contains. In Maia et al. [34], another X-tendo deliverable, BRPs are mentioned in a single paragraph as one of the data sources that the EU Renovation Wave strategy proposed to integrate into DBLs, again without further explanation. Both sources therefore position BRPs as data inputs to a DBL.

The X-tendo reports define a DBL as a common digital repository that stores all relevant building-related data throughout a building's life cycle. It integrates information from sources such as EPCs, BRPs, and SRIs across data types including technical systems, envelope elements, energy consumption, maintenance, and administrative records, supporting transparency, informed decision-making, and information sharing among stakeholders. The X-tendo project emphasises that the DBL should be interoperable with existing databases, user-friendly, and continuously updated, supporting energy efficiency improvements and the transition to a decarbonised building stock.

A similar pattern, framed around terminology rather than data flows, appears in Karami et al. [35]. In a semantic-mapping comparison of seven building-data models, Digital Building Logbook and Digital Building Passport are used as interchangeable terms (DBL/DBP) for a single repository of static as-built data and dynamic Key Performance Indicators across the building life cycle, and the authors observe that the term Building Passport has by now supplanted the older Building Logbook terminology. Renovation passports (such as the ALDREN BRP) are included among the building-data models compared, but the paper does not spell out an architectural relationship between the BRP and the DBL: it treats them as comparable data-model instances within a broader BL/BP family, without positioning one as containing or feeding the other.

B: Sources distinguishing DBLs and BRPs as separate tools

Several sources distinguish between DBLs and BRPs as separate instruments, following the definitions established in the recast EPBD IV [7]. In this framing, the DBL is defined as a common repository for all relevant building data, including data related to energy performance, with the purpose of improving market transparency, reducing costs and risks, and enabling more effective decision-making. The BRP is defined as a tailored roadmap for the deep renovation of a specific building in a maximum number of steps that will significantly improve its energy performance.

These EPBD IV definitions are adopted directly in Barbosa and Almeida [22], treating the DBL as a data repository and the BRP as a renovation roadmap, without further analysis of how the two relate to each other. Similarly, in Dorizas et al. [36], the DBL is described as a data repository that integrates all building-related data from BRPs, SRIs, Level(s), and EPCs to ensure compatibility and integration throughout the renovation journey, with emphasis on its purpose as a user-friendly dashboard. BRPs are noted as contributing to energy savings and carbon emission reductions as one of their main benefits.

The DBL and BRP are also treated as separate but complementary instruments in Zsak et al. [37], where the DBL is described as a gateway that integrates datasets on energy, materials, and building performance, reinforcing BRPs as instruments for both sustainability monitoring and policy alignment.

C: Sources describing BRPs as the overarching tool, consisting of a logbook and roadmap

A substantial body of literature, particularly from the Buildings Performance Institute Europe (BPIE), iBRoad, and ALDREN research projects, positions the BRP as the overarching tool, composed of two main elements: a data repository (or logbook) and a renovation roadmap.

The BRP concept was introduced in Fabbri et al. [3] as a document, in electronic or paper format, that outlines a long-term (up to 15 or 20 years) step-by-step renovation roadmap for a specific building, resulting from an on-site energy audit. This definition notes that the BRP can include a digital logbook as a repository for building data, financing options, energy bills, and maintenance records alongside the renovation roadmap. An analysis of three national BRP initiatives [3, 11] showed that a logbook component was integrated in the Flemish *Woningpas* (housing passport), while the French *Passeport Efficacité Énergétique* was not itself a logbook but contributed to a separate government-mandated digital logbook; the German *individueller Sanierungsfahrplan* (iSFP, individual renovation roadmap) did not foresee a logbook component at all.

This two-part structure was further developed within the iBRoad project. Within this project, the BRP was described as comprising both an individual renovation roadmap and a building logbook [38], referred to respectively as the iBRoad-Plan and the iBRoad-Log [11]. The logbook component is further elaborated in Monteiro et al. [39] as a repository for all building-related information, with 21 proposed functionalities organised into seven categories, including building data storage, diagnosis, displaying the renovation roadmap, alerts, sharing, benchmarking, and links to external services.

The ALDREN project adopted the same architecture for non-residential buildings. In Salvalai et al. [40], the BRP structure is explicitly defined as composed of two main elements: a data repository, referred to as the logbook, and a renovation roadmap, implemented as the ALDREN BuildLog and ALDREN RenoMap respectively. A four-level data granularity structure is described in Zirngibl et al. [41], in which data at Level 2 populates the Logbook, while Level 3 represents the core data appearing on the BRP cover. Multiple publications from this project [42, 43] confirm this structure, with the DIKW (Data-Information-Knowledge-Wisdom) hierarchy further applied in Sesana et al. [43] to describe how building data flows from raw inputs through the BuildLog to actionable renovation recommendations in the RenoMap.

This position is synthesised most concisely in Gómez-Gil et al. [44], which describes the DBL as one of two fundamental parts of the BRP, alongside a renovation roadmap, and notes that public administrations and research groups working on its definition agree on these two components. Historical context is provided in Gómez-Gil et al. [45], which observes that the DBL concept had already begun to take shape in academia, where it was associated with a renovation roadmap to form what became known as the building renovation passport.

D: Sources describing DBLs as the overarching tool, containing BRPs

A contrasting view, which emerged more recently in the policy literature, positions the DBL as the overarching framework within which BRPs are stored or accessible. This framing originates from the EPBD IV itself, which states in Article 12(8) that Member States must ensure the renovation passport is stored in, or can be accessed via, the digital building logbook where available [7, 46].

In the report by the European Commission's Executive Agency for Small and Medium-sized Enterprises (EASME) [12], the DBL is defined as a common repository for all relevant building data and the BRP is positioned as one of several functionalities of the DBL, listed alongside features such as document storage, material traceability, and Building Information Modelling (BIM) integration. In this framework, the BRP generates data (such as building-specific renovation recommendations) that feeds into the DBL's data fields.

The same framing is followed in Alonso et al. [47], where the BRP is treated as one of several data sources, alongside the Smart Readiness Indicator, Level(s), and Digital Product Passports, that feed into the DBL. The EPBD recast definition of the DBL is cited as a common repository for all relevant building data, including renovation passports. A similar position is taken in Karami et al. [48], citing both the EPBD and Global Alliance for Buildings and Construction (GlobalABC) definitions that list the renovation passport as one of several data types housed within the DBL, and concluding that the overarching concept is to develop a single repository, the DBL, that holds all building-related data for a building's entire life cycle.

In Gyuris et al. [49], an EUB SuperHub project deliverable, the DBL is structured as eight modules covering administrative, general, element, operational, performance, smart-readiness, financial, and BIM-documentation data. Renovation passports are not one of the modules; following the December 2021 EPBD recast proposal, the authors instead frame them as one of several data types the DBL holds or links to, alongside EPCs and Smart Readiness Indicators. The proposal's renovation-passport definition (a tailored roadmap for renovating a specific building in several steps) is quoted by the report. A separate literature-review chapter describes the iBRoad and ALDREN BRP-as-overarching architectures (category C above) at length. For its own data-structure analysis, however, the report treats the iBRoad-Log and ALDREN BuildLog (the logbook components of those BRPs) as DBL data structures comparable to the European Commission's Study EU DBL and the X-tendo logbook. The iBRoad and ALDREN BRP framing is therefore acknowledged but not adopted.

Two further sources reach the same overarching framing under different terminology, equating Building Passport (BP) with the DBL while still positioning BRPs as separate, narrower instruments whose data feeds into the broader repository. In Hartenberger et al. [50], the GlobalABC guideline, a BP is defined as a whole-life-cycle repository of building information, and BP, DBL, and Electronic Building File are explicitly treated as interchangeable terms. Renovation passports, alongside material passports, EPCs, and sustainability certifications, are described as narrower instruments whose data can be directly added to the BP as readable documents or digitally tagged to it via a unique building identifier. In Buchholz and Lützkendorf [51], the same conclusion is reached via a structured comparison of BP and DBL definitions in the literature: although different terms are used, the underlying definitions converge on essentially the same set of features, so that BPs and DBLs can be treated as a single tool. Renovation passports, material passports, BIM, and digital twins are distinguished as separate building-information-management tools, and a job-sharing approach is proposed with BPs at the forefront, in which renovation roadmaps are implemented alongside the BP/DBL rather than independently.

The ambiguity between categories C and D is noted in Koronen et al. [46], which recommends that the Commission must distinguish between the definitions and clarify the relationship between BRPs and DBLs to avoid perceived conflict or overlap.

E: Sources discussing only the concept of BRPs

Some sources discuss BRPs without reference to DBLs. In Lundgren [52], a thesis on Swedish BRP implementation, the BPIE definition of a BRP as a long-term step-by-step renovation roadmap is adopted, but the concept of a Digital Building Logbook is not mentioned. Similarly, in Plebankiewicz and Grącki [53], the BRP is described as a tool designed to encourage cost-effective renovations through a tailored roadmap, and the lack of a universally accepted definition is noted, but DBLs are not discussed.

Adopted definition of a BRP

The analysis above reveals a fundamental tension in the literature: earlier research projects (such as iBRoad and ALDREN) positioned the BRP as the overarching tool containing a logbook and roadmap (category C), while more recent EU policy instruments position the DBL as the overarching repository that stores renovation passports among other data (category D).

Following the EPBD IV and the most recent policy framing (category D), this thesis adopts the following definition: a **Building Renovation Passport (BRP)** is a building-specific, long-term renovation roadmap, consisting of a sequence of energy efficiency renovations, which draws on and is stored in or accessible via a DBL. The BRP therefore only needs a subset of the data a DBL would hold, and its renovation recommendations are one of several outputs that such a repository can support.

For differentiation: a **Digital Building Logbook (DBL)** is a central repository for all relevant building data throughout a building's life cycle; it provides the data foundation on which a BRP's personalised renovation recommendations are built. The DBL is invoked in this thesis only insofar as it informs the BRP definition and the data that a BRP draws upon; it is not itself the object of study. The empirical work, the research questions, and the remainder of this thesis narrow to the BRP.

2.1.3. The Dutch implementation: *Landelijke Voorziening Gebouwgegevens*

The DBL and BRP definitions surveyed in Section 2.1.2 stay at the EU policy level. The Dutch implementation runs on two parallel tracks, the *maatwerkadvies*-based BRP (Section 1.3.1) and the data layer (Section 1.3.2). This section takes up the data-layer track, drawing on the Kadaster scoping study [23][3]. It describes what the LVG is intended to be, where it sits in the wider Dutch data federation, what its planned MVP contains, and where its planned scope falls short of what a staged Dutch BRP would draw on.

Definition and federated framing

In the scoping study, the LVG is defined as a set of tools and agreements that make building-related data from multiple (government) sources accessible in a federated manner, offered through a digital portal in which authorised data consumers can view and use the connected data. The wording carries two design commitments that distinguish the LVG from a centralised database. First, it is a *connecting* service rather than a primary source: the scoping study is explicit that the LVG is not itself a source and only uses existing or newly-formed sources, with storage handled decentrally where possible and centrally where necessary. Second, it is positioned as a service that facilitates application-building by data consumers (both public and private) rather than as a finished consumer-facing product. Its development is to follow the principles of the wider *Federatief Datastelsel* (FDS, Federated Data System), the cross-

[3]Unless stated otherwise, the statements in this section that describe what the LVG is meant to be, how it is to be organised, what its MVP contains, and what is out of scope are drawn from that scoping study; additional sources are cited inline where independent material is brought in.

sectoral Dutch government data-sharing framework. The scoping study directly adopts the FDS's governing principle, *decentraal wat kan, centraal wat moet* ("decentralised where possible, centralised where necessary") [54]. The scoping study acknowledges that this federated model exposes the LVG to source-quality and source-availability risks that a centralised store would not face.

The LVG sits alongside two adjacent Dutch data frameworks. The *Digitaal Stelsel Gebouwde Omgeving* (DSGO, Digital Framework for the Built Environment) addresses the data-sharing needs of the design, construction, and engineering sector, with an emphasis on reducing failure costs in the construction process [55]; the scoping study positions the LVG as a supplier of building data into the DSGO rather than as a part of it. The *Stichting Marktfacilitering Functioneel Beheer en Afsprakenstelsel* (MFFBAS, Dutch energy-data exchange foundation), in turn, governs the sharing of meter and grid data under the new *Energiewet* (Energy Act), and is identified as the natural route through which energy-consumption data would reach the LVG.

The Minimum Viable Product

European obligations explain a substantial share of the urgency behind the LVG. The 2024 EPBD recast imposes three building-level information requirements on Member States, covering the voluntary renovation-passport scheme (Art. 12), the facilitation of building-system data exchange (Art. 16), and the establishment of a national database for the energy performance of buildings (Art. 22) [7]. The scoping study frames the LVG as a way for BZK to be ready for these obligations, while noting that Article 12 is delivered on a separate Dutch track via the *maatwerkadvies* (see Section 1.3.1) and is not itself assigned to the LVG; the LVG could nonetheless plausibly supply some of the data a future BRP would draw on. The scoping study itself flags ambiguity about whether the LVG should be read as a collecting service, the Dutch implementation of the EPBD IV information articles, a broader DBL, or the staged trajectory through which these are progressively delivered, and resolves this by limiting its scope to the sustainability and decarbonisation reading and to the EPBD IV information requirements.

Within that scope, the scoping study specifies a Minimum Viable Product organised around a single first use case framed from the homeowner's perspective: viewing all of one's own home data coherently at a single central point in the Netherlands. The MVP draws on four sources, two open and two partly or fully closed:

- the BAG, which provides addresses, year of construction, surface area, intended use, and map location, and acts as the connective tissue for almost every building-related dataset in the country (open);
- PDOK, which serves geo-datasets from a wide range of Dutch public sources, including the *Basisregistratie Topografie* (Key Register of Topography), *Basisregistratie Grootschalige Topografie* (Key Register of Large-Scale Topography), and 3D-*basisvoorziening* (3D base-data service) (open);
- EP-Online, the official national database of registered energy labels and their underlying energy-performance indicators (partly closed);
- ISDE, the subsidy register administered by RVO that records subsidies awarded to homeowners for energy-renovation measures (fully closed).

Access in the MVP is intended through *MijnOverheid* (the My-Government citizen portal) with DigiD authentication, aligning with the existing Dutch *Mijn-omgeving* (my-environment) pattern that citizens already use to view government-held information about themselves. Beyond the citizen-facing MVP, the scoping study's roadmap envisages extending the LVG to professional users (energy advisors, the construction sector, financial institutions, and software developers building applications on top of the LVG), accessed not through DigiD but through authorisation by the building owner or occupant.

Gaps relevant to a Dutch BRP

A recurring theme in the scoping study is that the four MVP sources, despite covering a substantial portion of basic building data, are imperfect at the level of detail a renovation-roadmap instrument needs. Three patterns matter for the BRP context:

- **EP-Online.** Roughly 300 attributes underpin each registered energy label, but most of them are not openly available; RVO retains the input data in a closed environment, and standardised, automated APIs for the closed attributes are not yet in place. Energy labels remain valid for up to 10 years, with no obligation on subsequent owners to register intervening changes.
- **ISDE.** The link between subsidy records and BAG-objects is incomplete in older data: only the most recent records are linked at BAG-*verblijfsobject* (residence-object) level; records from 2021 to mid-2023 are linked only at BAG-*pand* (premises) level (with non-unique mapping back to *verblijfsobjecten*); records from before 2021 carry no reliable BAG link at all. The subsidy stream therefore reflects that changes were made rather than the building's resulting end-state.
- **VerbeterJeHuis.** Although out of MVP scope, the scoping study uses Milieu Centraal's verbeterjehuis.nl as a worked example of the gap. Its calculation engine still relies on default values and on user-entered information for many fields (type of dwelling, year of construction, roof type, roof surface), because no automated source for those is available. The site itself is investigating whether EP-Online's underlying attributes could replace those defaults.

These are not incidental limitations. The scoping study concludes that data quality, metadata, and the legal framework for re-using existing data for new purposes will require sustained organisational work before the LVG can deliver against the broader EPBD IV ambitions.

A parallel set of gaps follows from what the LVG MVP explicitly excludes. Dossiers established under the *Wet Kwaliteitsborging Bouwen* (the as-built *dossier bevoegd gezag* delivered to the municipality on completion, and the consumer dossier delivered by the contractor to the building owner) and the materials-passport trajectory under the *Transitieagenda Circulaire Bouweconomie* (Transition Agenda for the Circular Construction Economy) are recognised in the scoping study but are not part of the planned MVP. As a result, three categories of data that a multi-step renovation roadmap depends on are not present in the planned MVP: the building's renovation history (sequence and dates of measures already executed), the post-renovation performance once a measure has been carried out, and the materials-and-construction detail at envelope and component level.

Implication for a Dutch BRP

The LVG, as scoped in 2024, is a piece of public infrastructure aimed at making existing *public* building data coherently accessible. The Dutch BRP, as built on the *maatwerkadvies* (Section 1.3.1), is a separate *advisory* instrument issued by certified *maatwerkadviseurs*. The two are intended to interact, but the scoping study's MVP scope does not yet include the data a multi-step renovation roadmap depends on, and the report acknowledges in general terms that existing public sources are not yet sufficient to cover all information needs. In current Dutch practice these data sit dispersed across professional records, paper archives, on-site surveys, and personal communication between successive advisors. Whether the LVG's planned scope is sufficient for the data needs of the Dutch professionals who would write a Dutch BRP, and what those professionals themselves expect of a Dutch BRP that is supposed to draw on such an infrastructure, is the empirical question this thesis sets out to answer (see Section 1.4).

2.2. Part 2. Renovation: the owner-occupier perspective

This part shifts from data to the renovation process itself. It gives a brief background on renovation for individual owner-occupiers, synthesises the barriers and drivers that shape their decision-making, positions the decision-making stages along which these barriers arise, and identifies the stakeholder groups that advise Dutch owner-occupiers across those stages. These findings feed into Part 3, where they are read back as implicit requirements for a Dutch BRP and weighed against the presentation layer of existing BRP-style tooling.

2.2.1. Barriers and drivers for owner-occupier renovation

Understanding the barriers that prevent and the drivers that motivate owner-occupiers to undertake energy-efficient renovations matters here for two reasons. First, it contextualises why current renovation rates fall far below policy targets: the barriers identified in the literature describe the structural and behavioural obstacles that information tools such as BRPs are intended to help homeowners overcome. Second, the drivers reveal what motivates homeowners when they *do* renovate, which informs how renovation information should be structured and presented in a BRP.

Source identification and coding strategy

The literature on owner-occupier barriers and drivers for energy renovation was gathered through searches in Scopus and Google Scholar, supplemented by snowballing of references from each retrieved paper. The searches combined homeowner-related terms (*homeowner*, *owner-occupier*), renovation terms (*energy renovation*, *energy-efficient renovation*, *energy retrofit*), and terms for the kind of finding sought (*barriers*, *drivers*, *motivation*, *decision-making*). Additional searches with *building renovation passport* were run to pick up the European policy ecosystem in which Dutch BRPs are being developed. No date restriction was imposed; the retained set ranges from 2008 to 2025, with most sources dated 2018 or later.

A source was retained when it explicitly named one or more factors hindering or motivating an owner-occupier's decision to renovate, and discarded when it referred to such factors only as undifferentiated background. Approximately 150 documents were screened at title and abstract level; after full-text reading, around 40 met the inclusion criterion and were coded, with 34 of these used for the barriers synthesis and 29 for the drivers synthesis. Each named barrier or driver was extracted verbatim from its source and entered into a coding spreadsheet; recurrent themes were then identified inductively by overlapping factors with similar substance across sources. The five barrier clusters and eight driver clusters in Table 3 and Table 4, along with their labels, emerged from this overlap analysis rather than being imposed from a prior taxonomy.

The synthesis carries one caveat. Several of the cited grey-literature sources originate from the interlocking BPIE-led Horizon projects iBRoad, iBRoad2EPC (its follow-up project linking iBRoad roadmaps to EPCs), and X-tendo, and share institutional framing rather than constituting independent voices; the primary empirical anchor in this cluster is the three-country iBRoad survey by Volt et al. [24].

A barriers-and-drivers framing is appropriate here because a BRP is, at its core, an information instrument. It can plausibly address barriers and drivers that are themselves informational (knowledge gaps, conflicting advice, opaque cost-benefit) or that are amplified by missing information (uncertainty about installer quality, uncertainty about payback).

Barriers

Barrier	Count	Sources (34 total)
Lack of information and knowledge		
Available information is not in a format understood by homeowners, e.g. complex EPC reports	2	[38, 56]
Lack of, and hard to find, reliable information about renovation options and benefits	10	[19, 22, 24, 57–63]
Homeowners do not know which measures to take, or in what order, and what are good options	11	[22, 24, 29, 38, 59, 60, 64–68]
Lack of awareness about non-monetary benefits, and lack of knowledge on the status quo	9	[22, 24, 29, 38, 58, 59, 69–71]
Lack of knowledge about monetary benefits, and owners do not want/ cannot do own calculations	15	[22, 29, 38, 57–62, 65, 69, 71–74]
Lack of knowledge about costs	3	[22, 58, 69]
Professional/Expert perceptions		
Confliciting advice/ no reliability from professionals, e.g. due to being only expert in own field	7	[19, 20, 24, 29, 56, 68, 72]
Lack of energy-efficiency knowledge/ expertise by craftsmen (e.g. on new technologies/ materials)	12	[29, 38, 56, 58–62, 70, 72, 73, 75]
EPC recommendations are ignored or not remembered, and mainly focus on energy/ too generic	4	[19, 38, 68, 72]
Lack of trust in professionals/ professional information sources	8	[19, 20, 22, 24, 69, 71–73]
The time, effort and coordination needed to find (reliable) professionals	9	[20, 22, 24, 57, 58, 60, 65, 70, 76]
Financial barriers		
High upfront costs	19	[20, 22, 24, 26, 29, 57–59, 62, 63, 66, 70, 73, 75–80]
Limited knowledge of financing options, grants, and subsidies	5	[22, 29, 38, 58, 69]
Limited availability and access to finance (including grants; subsidies), reluctance to loans	14	[22, 24, 29, 57–60, 62, 63, 73–75, 77, 80]
Applying for financial support is (perceived) administratively difficult	4	[22, 58, 59, 76]
Perceived long and uncertain payback periods, especially with low(er) energy prices	8	[22, 29, 58, 59, 62, 63, 70, 80]
Perceived complexity/hassle		
The overall renovation process is perceived as too complicated	3	[19, 71, 79]
Renovation is seen as disruptive, time-consuming, complex or unpleasant (hassle factor)	19	[17, 22, 24, 29, 38, 57, 58, 60, 62, 63, 65, 66, 68, 69, 71–74, 80]
Homeowners view measures as technically complicated and/or of high risk	11	[18, 22, 24, 58, 61, 65, 71, 74, 76, 79, 80]
Motivation and attitudes		
Energy savings/ CO2 reductions are only seen as secondary or added benefit, not the actual reason	5	[22, 59, 71–73]
Negative attitudes, e.g. towards heat pumps, resulting in doubts/ uncertainty about results/quality	7	[57, 61, 66, 71, 73, 76, 79]
Homeowners think no (further) refurbishment is needed, they are satisfied with the status quo	11	[24, 29, 57, 59, 61, 66, 71, 73, 75, 79, 80]
Homeowners have other priorities, and often not interested in energy efficiency	7	[22, 24, 29, 57, 59, 79, 80]

Table 3: Overview of barriers perceived by owner-occupiers. Own work.

The barriers in Table 3 fall into five clusters. The first concerns information and knowledge gaps, dominated by uncertainty about expected monetary returns and by difficulty finding reliable information about which measures to take. The second concerns professional reliability, where finding trustworthy installers and reconciling conflicting specialist advice are the most-cited concerns. The third is financial, anchored in upfront cost and limited access to subsidies. The fourth covers the complexity and hassle of renovation, both of the process and of the measures themselves. The fifth and smaller cluster covers motivation and attitudes, including satisfaction with the status quo and reluctance towards specific technologies such as heat pumps.

The pattern across these clusters suggests that the dominant barriers for owner-occupiers are not exclusively financial. Even with the cost barriers set aside, information gaps, hassle, and trust in professionals together still account for the majority of the reported barriers. An instrument that addresses the financial barriers but ignores the informational and trust-related ones is unlikely to move adoption rates substantially on its own.

Drivers

Driver	Count	Sources (29 total)
Quality of Life & Comfort		
Improving thermal comfort (warmth, temperature control)	16	[24, 29, 57–59, 63, 65, 71–76, 79, 81, 82]
Improving indoor air quality and ventilation	4	[58, 65, 82, 83]
Reducing condensation, draughts, and dampness	3	[58, 62, 81]
Improving acoustics and reducing noise	3	[58, 81, 83]
General improvement of living conditions and quality of life	9	[58, 65, 71–74, 76, 79, 81]
Financial & Economic		
Saving on energy bills / reducing energy costs	18	[26, 29, 57, 58, 60–62, 65, 66, 69, 71–73, 75, 76, 79–81]
Increasing property value	6	[57, 58, 62, 65, 74, 81]
High or rising energy prices / energy price shocks	4	[71, 73, 74, 76]
Availability of grants, subsidies, and financial support	4	[29, 59, 74, 76]
Reducing dependence on fossil fuels / energy independence	1	[75]
Maintenance & Necessity		
Necessity of maintenance or repair (broken equipment, damage)	10	[29, 57, 59, 63, 65, 72, 73, 76, 79, 81]
Improving building appearance and aesthetics	5	[65, 71–74]
Preventing or repairing structural damage	2	[62, 65]
Environmental & Social		
Environmental concerns / contributing to climate protection	11	[29, 57, 66, 69, 71–75, 81, 84]
Social responsibility (towards tenants, community, future generations)	4	[71, 74, 76, 79]
Social norms and peer influence (neighbors, friends renovating)	6	[24, 71, 72, 74, 76, 79]
Pro-environmental identity and membership in environmental organizations	3	[71, 74, 84]
Technology & Innovation		
Interest in new/modern technology and innovation	2	[29, 75]
Increasing energy efficiency and reducing energy consumption	6	[29, 57, 65, 74, 75, 79]
Personal & Household		
Planning to sell the house (making it easier to sell)	2	[58, 81]
Life stage events (retirement, children leaving, moving in)	2	[63, 73]
Personal/professional background in technology or sustainability	2	[18, 29]
Higher education level	3	[58, 71, 74]
Younger age (more environmental awareness)	1	[71]
Information & Support		
Access to trusted, reliable information and advice	6	[19, 29, 71, 73, 74, 76]
Energy audits and personalized assessments	3	[29, 59, 73]
One-stop-shops and comprehensive support services	3	[17, 22, 65]
Demonstration projects and seeing successful examples	2	[59, 79]
Convenience & Bundling		
Bundling energy efficiency with other renovations (e.g., barrier-free, aesthetic)	2	[63, 73]
All-in-one offers reducing hassle and complexity	2	[22, 29]

Table 4: Overview of drivers perceived by owner-occupiers. Own work.

The drivers in Table 4 concentrate on a much smaller number of strongly cited rows. Saving on energy bills and improving thermal comfort sit well ahead of the rest, with a long tail of less-cited motivations behind them. A third tier covers maintenance and necessity, where renovation is triggered by broken or worn equipment rather than positive renovation intent. Quality-of-life motivations beyond pure thermal comfort, such as indoor air quality and reduced noise, make up a further cluster, while environmental motivations form a steady but secondary band.

Two points emerge. First, the two most-cited drivers, comfort and energy-bill savings, are essentially private-good motivations: the owner-occupier is improving their own house for their own benefit. Environmental and societal motivations are present across the literature but rarely dominate. Second, several drivers are mediated by information and support rather than by money: access to trusted advice, energy audits, one-stop shops, and exposure to demonstration projects appear consistently, suggesting that information tools have a role to play not only in lowering barriers but in activating drivers that would otherwise remain dormant.

Taken together, improving thermal comfort and saving on energy bills emerge as the two primary drivers of owner-occupier renovation across the reviewed literature. Their dominance over environmental and societal motivations is the foundation for the misalignment argument developed in Section 2.3.2, where these driver findings are compared against the metric focus of existing BRP-style tooling.

2.2.2. The decision-making stages of homeowners during retrofits

Understanding how homeowners move through the renovation process is relevant for this research because it contextualises *when* different stakeholders become involved and *what kind* of information is needed at each point. While the specific data requirements are the subject of the empirical work in this thesis, the literature provides a useful framing of the stages through which homeowners progress.

Multiple studies have proposed staged models of the homeowner renovation decision-making process [26, 29, 57, 60, 63, 73, 74, 85–87]. While the number and naming of stages varies across these models, they broadly converge on a three-phase structure, as illustrated in Figure 2.3.

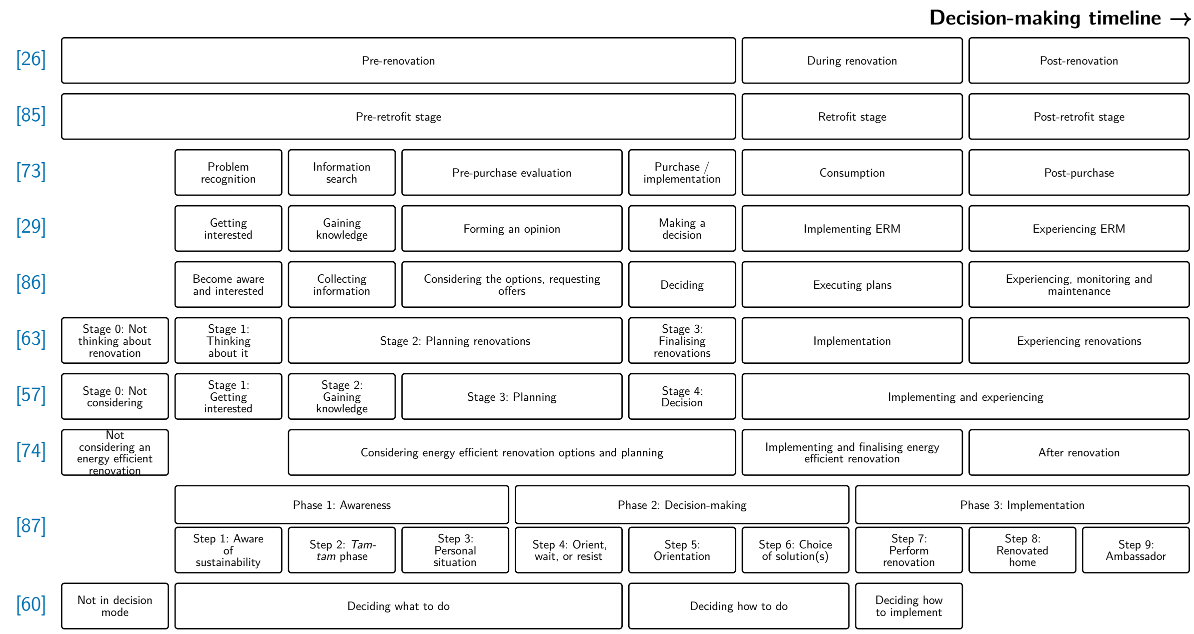


Figure 2.3: Schematic overview of the homeowner renovation decision-making process, synthesised from the studies cited above. Each row aligns to a shared ten-column reference timeline in which the leading column captures the pre-thinking stage and the remaining nine columns correspond to Kooger's nine steps; rows that omit the pre-thinking or post-implementation phase sit further inward. Own work.

In Kooger et al. [87], a study of Dutch testing grounds for gas-free neighbourhoods, the homeowner journey is grouped into three phases. Awareness covers steps 1-3, decision-making covers steps 4-6, and implementation covers steps 7-9. Greco and Olivadese [17] summarise the conversion-rate data underlying this framework and report substantial attrition along the journey. Approximately 68% of customers drop out after the awareness phase, only around 17% reach the choice-of-solution step (step 6), and only about 5% complete the journey through to ambassadorship (step 9).

This attrition has consequences for the present research. It suggests that the information tools available to homeowners in the awareness and decision-making phases may be insufficient to sustain engagement. As discussed in the preceding section on barriers and drivers, the current emphasis of existing tools on energy performance metrics, rather than on cost savings and comfort improvements, may contribute to this drop-off. The different phases also involve different stakeholders. The early phases are characterised by interaction with online tools, energy coaches, and municipal information channels, while the later phases involve energy advisors, contractors, and financial intermediaries. This phased stakeholder involvement is reflected in the interview design of this research.

2.2.3. Stakeholder groups relevant to owner-occupier renovation

The stakeholders relevant to residential energy renovation are most comprehensively mapped in the DBL literature, where the full group of actors across the built environment value chain is researched and documented. The EU, in their Definition of the Digital Building Logbook report, identified 17 stakeholder groups [12]. Subsequent research built upon and expanded this inventory considerably. In Hwang [88], based on a literature review, a survey, and focus group sessions across four European regions, and drawing on the grouping by the European Commission's Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (DG-GROW) among other inputs, 38 distinct stakeholder groups are identified as potential data users and providers for a DBL. Table 5 provides an overview of all identified stakeholder groups in both studies.

Owner-occupiers*	Distribution network operators (DNOs)	Tenants (lessees)*
Real estate agents*	Landlords and/or leasers*	Competent person schemes
Architects and designers*	Renovation advice providers	Valuers*
Investors*	Researchers*	Energy data providers
Construction contractors*	Service designers (UX)	Demolition contractors*
IT providers	Banks and/or insurers*	Funding parties
Certifiers*	Retrofit service providers	Energy experts
Local authorities	Utility providers*	Maintenance contractors
Public authorities*	Social housing providers	Energy suppliers
Public waste agency	Building material suppliers*	International organisations
Policy makers*	Surveyors	Data companies (inventories and registering)
Guarantee bodies	Developers (real estate)*	Lawyers, solicitors and/or conveyancers*
Facility and/or building managers*	Building safety regulators	

Table 5: Stakeholder groups identified by Hwang [88]; * also identified in the EASME report [12]. Own work.

Source identification and selection strategy

The sources reviewed were identified through an exploratory search in Scopus and Google Scholar. The search focused on combinations of terms related to stakeholders, owner-occupiers, renovation, and The Netherlands. In addition, previous related publications were consulted, and their references were checked, including the DBL stakeholder mapping by Hwang [88], to avoid missing relevant studies that may use different terminology for similar actors.

All candidate papers and reports were then screened in stages. The first filter was contextual: only studies with a clear Dutch residential renovation setting were retained. Publications from non-Dutch contexts were excluded for this chapter, even when methodologically strong, because advisory ecosystems and actor roles are context-dependent and not directly transferable. The second filter was conceptual: papers were included only when they concretely identified stakeholder groups and described their advisory or information role in the owner-occupier renovation process. Papers that only referred generically to “stakeholders” or “professionals” without specifying actor types were used as background context but not as core evidence for stakeholder extraction.

To avoid ambiguity, a source was only included in the evidence table when it met *all* of the following criteria:

- Dutch residential renovation context
- Explicit owner-occupier focus
- Explicit stakeholder identification at actor level (not only generic labels)
- Explicit advisory/information/execution role in homeowner decision-making

Approximately 25 papers and reports were screened in total, of which 9 met all four criteria and were retained for stakeholder extraction. The stakeholders identified in this chapter were derived textually from these included Dutch sources: every party with a meaningful role in advice, information provision, or decision support was extracted and categorised. Table 6 shows which stakeholders appear in which paper. Where a stakeholder category from the broader DBL literature does not appear in this review, this is treated as indicative evidence that it does not play a central role in advising Dutch owner-occupiers in the reviewed material; this remains absence of evidence rather than definitive exclusion. Therefore, one interview objective in the next phase is to test whether relevant stakeholder groups are still missing.

Initial exclusions and limitations

Several studies were initially considered relevant at title/abstract level but excluded after full-text screening. In summary, exclusions were made for three reasons: (1) context mismatch (non-Dutch settings such as Germany, UK, Sweden, Norway, China, or broader EU-only scope), (2) missing explicit actor-level stakeholder identification, and/or (3) insufficiently explicit advisory/information role for Dutch owner-occupier decision-making. They remain useful as contextual comparison literature, but were not used as coded evidence in Table 6.

Stakeholder group	[29]	[89]	[81]	[87]	[90]	[26]	[65]	[58]	[69]	**Total**
Energy auditor / EP advisor	✓			✓	✓				✓	4
Municipalities / local government	✓	✓	✓	✓	✓	✓	✓	✓		8
Installers & contractors	✓	✓		✓	✓	✓	✓	✓		7
Social networks and energy ambassadors	✓	✓	✓	✓	✓		✓	✓		7
Online tools / digital platforms	✓		✓		✓	✓	✓	✓		6
Energy / heat suppliers		✓		✓				✓		3
Government info agencies (RVO, Milieu Centraal)			✓					✓		2
One-stop shops	✓	✓		✓			✓	✓		5
Construction stores / DIY companies						✓	✓	✓		3

Table 6: Information sources identified across the reviewed literature. Own work.

The stakeholder set is also not uniform across all renovation types: the actors involved depend heavily on the scale and scope of the intervention. A homeowner replacing windows or installing solar panels will typically interact with a specialist installer and, perhaps, an online comparison platform. By contrast, a deep renovation involving structural changes, insulation, mechanical systems, and heating replacement is far more likely to engage a broader constellation of actors, including energy auditors, multiple contractors, and potentially a one-stop shop or municipal programme. This means that the stakeholders described in this chapter should not be read as a fixed set that every homeowner encounters, but rather as a pool from which different subsets become relevant depending on the nature and ambition of the renovation being considered.

This resulting set of stakeholders is thus a subset of the broader DBL/BRP actor pool, filtered by the relevance aforementioned. For each stakeholder identified, a summary is given based on these sources which includes a characterisation of their typical role, whether they are a public or private party, what is important for them to do (or not), and whether they act as an intermediary between other actors in the information chain, since these aspects carry different implications for data responsibilities, trust, and data ownership.

It is also important to note that many stakeholder roles appear only implicitly in the literature, and are often referenced in broad terms such as “professionals” without clear actor-level differentiation. As a result, the mapping presented here should be read as an evidence-based synthesis of explicitly reported roles, not as an exhaustive census of all actors active in practice. This limitation reinforces the need for the interview phase, where stakeholder presence, role boundaries, and potentially missing actor groups can be validated and refined.

Energy auditor / EP advisor

Energy auditors, or energy performance (EP) advisors, are trained professionals who provide owner-occupiers with personalised, technical advice on energy efficiency measures through in-person home assessments.

Across the reviewed Dutch literature, the value of the auditor is described in consistent terms. The visit is reported to be appreciated when it provides objective, independent advice that is customised to the homeowner’s specific situation [29], and personal consultation by such an advisor is described as an essential part of the customer journey [90]. The role is also positively rated by the homeowners who experience it; in Kooger et al. [87], a 68.1% satisfaction rate is reported for the energy advisor role in the Eemsdelta testing ground. The function itself sits at a specific point in the homeowner trajectory: in Akbari et al. [69], the energy audit is positioned as a discrete stage following the initial awareness and information-gathering phase, distinct from and downstream of it.

The recurring justification for this independent advisory step is the contrast with installer-provided advice. ERM installers are reported to provide ambiguous and product-specific information that is not always in the homeowner’s best interest, leaving homeowners uncertain about the best choice for their situation [29]. The auditor’s value is therefore framed less as one more information source and more as a corrective to an information environment that is already perceived as commercially biased.

Municipalities / local government

Local governments combine several roles in residential energy renovation, ranging from information provision and financial facilitation to programme coordination and public participation. As with the energy auditor, trust is a recurring theme across the reviewed Dutch literature.

The most effective version of the municipal role is described in similar terms across studies. In De Koning et al. [89], an intensive, personalised approach involving home visits and a visible neighbourhood presence appears effective, although the sample is too small to draw definitive conclusions, and in Kooger et al. [87], trust, resident involvement, and good communication are reported as central to homeowners’ evaluation of the gas-free process. Two further refinements recur. Municipal strategies are recommended to differentiate by housing conditions and homeowner awareness, using building and household characteristics to address each renovation type appropriately [26, 81], and they are recommended to combine advice, financing, and implementation support into integrated packages rather than offering these in isolation [29]. Clear communication of district-level timelines is added as a further requirement in Looijen Bader and Oostra [90].

Despite this central coordinating role, municipalities themselves are not the channel homeowners turn to most. In Ebrahimigharehbaghi et al. [65], municipalities are reported among the least-consulted information sources by homeowners, even though more than 200 Dutch municipalities have established energy desks (energieloket.nl) providing personalised advice [58]. The picture that emerges from the Dutch literature is therefore one of available municipal infrastructure without proportional uptake: the advisory machinery exists and is recommended to be made more building-specific and better coordinated with financing, but it does not yet command the position in the homeowner journey that its coordinating role would suggest.

Installers & contractors

Installers and contractors are the technical professionals responsible for implementing renovation measures. In the Dutch literature, they occupy an ambivalent position. They are simultaneously the most-used information channel and the one whose information is judged the least reliable.

On the one hand, construction stores, DIY companies, and maintenance and installation companies are identified as the primary information sources for Dutch homeowners in Maghsoudi Nia et al. [26], and the same primacy is reported for construction stores and DIY companies, particularly for exterior and interior renovations, in Ebrahimigharehbaghi et al. [65]. On the other hand, the same channel is reported to give ambiguous, product-specific advice that is not always in the homeowner's best interest, because different installers promote different products [29]. The concern is observed from a different angle in Looijen Bader and Oostra [90], where the quality of installer knowledge and expertise is identified as a barrier while confidence in installer skills, when present, is identified as a motivator. Compounding this, finding a reliable contractor is consistently described as one of the main transaction cost barriers of the renovation process [58, 65].

One nuance from the execution phase is kept separate. In Kooger et al. [87], the resident experience of an ongoing renovation is reported to depend less on the absolute level of nuisance than on the way that nuisance is communicated, with customer-oriented contractors who communicate proactively, particularly about errors and schedule changes, contributing strongly to positive resident experiences.

Social networks and energy ambassadors

Social networks (friends, family, neighbours, and colleagues), together with energy ambassadors (peer residents who have already renovated), function as informal yet influential channels through which renovation knowledge and attitudes spread.

The influence of the immediate social network on owner-occupier decision-making is reported consistently across the Dutch sources. In Broers et al. [29], advice and experiences from friends, family, neighbours, and colleagues are described as influential on the renovation decision, and in Ebrahimigharehbaghi et al. [65], family and friends are identified among the consulted information sources for homeowners considering renovations. The weight of this peer effect is quantified in Looijen Bader and Oostra [90], where survey data from the *Blok voor Blok*

(Block by Block) programme are reported in which the experiences of others motivated 52% of participants.

The direction of this influence, however, is not uniform across the renovation timeline. Early in the process the picture is reported as predominantly negative. In De Koning et al. [89], the *'tam-tam fase'* (rumour-mill phase) of the customer journey is described as one in which incorrect or incomplete information about going gas-free spreads through social networks before residents have direct experience. Once a trajectory is under way, the function of peers shifts again. In Kooger et al. [87], homeowners undertaking individual renovation trajectories are reported to express a strong need for peer exchange both during and after the transition. After completion, the same network becomes a channel for diffusion. A comparable post-adoption dynamic is described in Broers et al. [29] as adopters influencing others in their social network, and in De Koning et al. [89] 'becoming an ambassador' is defined as the final step of the customer journey, at which renovated owner-occupiers share their experience with their social network, particularly when that experience has been very positive or very negative.

A formalised variant of this peer-educator role is the energy coach, who delivers personal consultations on behalf of a programme or municipality. In Looijen Bader and Oostra [90], these consultations are reported to be especially effective when the energy coach shares the same neighbourhood and background as the target group, reinforcing the social-proximity finding already observed for informal networks. The same logic of direct experience and proximity underpins two policy recommendations in the reviewed literature. In Broers et al. [29], facilitating visits to renovated homes is recommended, so that potential adopters can experience measures first-hand rather than rely on abstract information. In Ebrahimigharehbaghi et al. [81], households with a higher renovation probability are recommended to be addressed first, since they can subsequently diffuse knowledge to others.

Online tools / digital platforms

Digital platforms and online tools aim to support homeowners throughout the renovation process by making energy-related information, product comparisons, and professional services more accessible. The reviewed Dutch literature is in broad agreement, however, that the current set of tools is fragmented and difficult to filter for reliable information, and that this fragmentation has both an institutional and a commercial origin.

On the institutional side, the supply of digital tools mirrors the fragmentation of the underlying renovation programmes. The Netherlands is described as partitioned into 30 energy regions, each developing its own Regional Energy Strategy, with renovation policies varying by municipality [26], and Looijen Bader and Oostra [90] inventory several national renovation initiatives, each with its own programme website. In the same survey, the quality and impact of interventions are described as not being objectively monitored across initiatives, and information is reported as presented in many different and sometimes contradictory ways [90]. On the commercial side, installers are reported as the dominant information source for energy efficiency renovations [65], while the advice they give is described as ambiguous and product-specific, because different installers promote different products [29]. The fragmentation that homeowners encounter online is therefore not only one of competing public programmes, but also one of competing commercial messages running through those same digital channels.

The reported homeowner reaction to this combined fragmentation is consistent across the Dutch literature. In Broers et al. [29], individual homeowners describe the current situation as an 'overkill of websites' where reliability is hard to assess, and call for a centralised, government-organised platform with objective guidance.

Against this background, the Dutch ecosystem already contains several specific platforms, although none of them is the single trusted source the homeowners in Broers et al. describe. Milieu Centraal functions as a national information centre [81], and Solvari operates as a comparison platform for obtaining free quotes from construction companies and installers [26]. The Energy Saving Explorer was developed as a tool enabling valuers, brokers, banks, and mortgage lenders to calculate potential energy savings for their clients [58], and in the climate agreement a further digital platform has been proposed to bring together demand and supply of energy efficiency renovations with a neighbourhood-oriented approach [65].

Even with this proliferation of tools, the Dutch literature is consistent that digital channels remain a supplementary layer. Personal consultation is described as essential alongside existing digital tools in Looijen Bader and Oostra [90], a position that aligns with the high valuations of in-person advice reported elsewhere in the reviewed Dutch literature.

Energy / heat suppliers

Energy and heat suppliers are commercial entities that provide energy products or heat distribution services to residential customers. The Dutch literature on this stakeholder is short, but it contains a clear before/after contrast that runs across two of the reviewed sources.

Before a renovation, in the Dutch district-heating case study of Purmerend, residents are reported to hold reservations about the monopolistic position of the heat supplier, the sustainability of the proposed heat sources, and negative past experiences with heat networks [89]. After a renovation, in Dutch testing-ground programmes, first experiences with gas-free living are reported as generally positive, with residents in Kooger et al. [87] rating living in a gas-free home an average of 8.7 out of 10. The two findings are not strictly contradictory, since they describe different points in the homeowner trajectory; read together, they suggest that the supplier-level distrust documented at the anticipation stage gives way to a more positive lived experience once the transition has been made.

Beyond this heat-supplier role, in Ebrahimigharehbaghi et al. [58], energy providers are also reported to have initiated their own campaigns to promote energy-saving products to homeowners, positioning suppliers as a further commercial actor distributing renovation information alongside installers.

Government info agencies (RVO, Milieu Centraal)

Government information agencies are public intermediaries providing objective technical and financial knowledge for energy renovation. In the Netherlands, Milieu Centraal provides informational resources, while the Netherlands Enterprise Agency (RVO) administers subsidy schemes such as ISDE and the *Subsidie Energiebesparing Eigen Huis* (SEEH, own-home energy-saving subsidy) [81].

Where the Dutch literature explicitly ranks information sources by perceived reliability, these public bodies are placed near the top. In Ebrahimigharehbaghi et al. [58], the most reliable information sources for homeowners are reported to include governmental bodies, homeowners' associations, and environmental agencies. This positions agencies like Milieu Centraal and RVO as the reliability counterpart to the commercially biased installer channel discussed above.

One-stop shops

The one-stop shop (OSS) is an integrated service model that consolidates multiple renovation services into a single point of contact, reducing complexity for homeowners.

This integration is one of the more consistently endorsed interventions in the reviewed Dutch literature, with all of the sources that discuss it pointing in the same direction. The combination of advice, implementation support, and financing into a single offer is reported to reduce the homeowner burden [29], and one-stop shops and pop-up stores at the neighbourhood level are reported to reduce transaction cost barriers and to create awareness, on what is essentially the same single-contact logic [58, 65]. The same mechanism is given a Dutch policy framing under the heading of *ontzorging* (unburdening). In Kooger et al. [87], *ontzorging* during execution is identified as a key driver and its absence as a major barrier, with homeowners reported to struggle to coordinate between different contractors and to desire a single point of contact. In De Koning et al. [89], governments are recommended to support the development of *ontzorgingsconcepten* (end-to-end relief products) precisely because they address the hassle factor identified as a major adoption barrier. Across these sources, the underlying argument is the same: where homeowners are otherwise required to assemble information, financing, and execution from different actors, an integrated single-contact model removes the assembly cost itself.

Construction stores / DIY companies

Construction stores and DIY companies supply materials and informational resources that homeowners use for energy-efficient renovations. Across the reviewed Dutch sources, they are consistently identified as among the primary information channels for Dutch homeowners [26, 65]. In Maghsoudi Nia et al. [26], they are placed alongside maintenance and installation companies in this primary position, and in Ebrahimigharehbaghi et al. [65], the same primacy is reported particularly for exterior and interior renovations. As discussed under installers and contractors, this prominence sits alongside reports in Broers et al. [29] that the broader commercial information channel, in which installers are the dominant actors, can be ambiguous and product-specific.

Financial institutions (banks, mortgage providers)

Financing recurs as a theme across the reviewed Dutch literature. Initial investment costs are consistently identified as one of the largest barriers to renovation [29, 58, 90], and the complexity of applying for loans and subsidies adds a further transaction cost barrier [58]. Two complementary refinements appear. In Looijen Bader and Oostra [90], new financing arrangements such as building-related financing are reported to have been experimented with but not yet to have produced structural measures, leaving a group of owner-occupiers financially unable to access renovation measures, and in Kooger et al. [87], subsidy availability and interest-free loan options are reported as decisive for some participating homeowners in the Dutch test grounds, although other participants describe these as influential but not decisive.

Despite the centrality of financing as a theme, banks and mortgage providers do not emerge as distinct advisory stakeholders in the reviewed Dutch sources. In Ebrahimigharehbaghi et al. [58], 87% of renovators in the Dutch sample are reported to have paid for energy efficiency measures themselves, a pattern the authors attribute to the complicated and time-consuming nature of subsidy applications, with most homeowners reported as preferring to pay directly rather than apply. While the same paper notes that mortgages from private banks are formally the most important financial support vehicle in the Netherlands and discusses cheaper energy-efficiency mortgages as a potential policy instrument, this is framed as background financial infrastructure rather than active guidance for homeowners [58]. Financial support in practice flows through other actors. One-stop shops are reported to bundle financing into integrated service packages [29], energy advisors are reported among the parties homeowners consult when arranging financing [87], and national programmes such as ISDE and SEEH are administered by RVO [81].

This positions financial institutions apart from the stakeholders described above and is the reason for their exclusion from Table 6. The Dutch literature and the broader DBL stakeholder literature disagree on this point: in the DBL inventory by Hwang [88], banks and insurers are explicitly identified as a relevant stakeholder group, whereas in the Dutch owner-occupier studies they do not appear in an advisory role. Whether banks play a more active advisory role in practice, for instance through green mortgage products or energy-efficiency lending conditions, is a question the interview phase can help address.

2.3. Part 3. Overlap: the BRP for homeowners

This part narrows to the BRP as an instrument aimed at Dutch owner-occupiers. It first reviews existing BRP-style tooling and its presentation-layer characteristics, then sets out the misalignment between the metric emphasis of that tooling and the dominant drivers identified in Part 2, and finally reads the rest of Part 2 (barriers, decision-making stages, and stakeholder roles) back as a set of implicit requirements for a Dutch BRP. The Dutch *gebouwrenovatiepaspoort* is scheduled to be published on May 29, 2026 and is therefore treated prospectively rather than as an existing artefact.

The scope of a BRP depends on the renovation context it is intended for. BRP-style instruments have been proposed for a wide range of contexts, including large-scale and commercially-driven renovations where elements such as whole-life-cycle assessment are central. For a Dutch owner-occupier living in and renovating their own home, many of those elements are less central, and the practical content of a BRP reduces to a narrower subset of the Annex VIII content framework of the recast EPBD [7]. The rest of this part therefore treats the BRP as the instrument aimed at this owner-occupier setting, and reads the existing tooling and the Part-2 findings against that scope.

2.3.1. Analysis of existing DBL/BRP initiatives

Building on the conceptual classification in Section 2.1.2, this section turns to how the reviewed instruments present information to their users. The set considered is the same 14 analysed in the parallel Geomatics thesis (see Section 1.9), and is deliberately broader than the BRP definition adopted in this thesis: several entries are adjacent building-data tools rather than BRPs themselves, included so that the comparison can draw on a wider set of data perspectives and field structures. Three are official national-level BRP or building-logbook instruments, namely the German *individueller Sanierungsfahrplan* (BRP), the Flemish *Woningpas* (building passport with a logbook function), and the French *Cléa* (national DBL). Six are EU-funded research-project data-model proposals: iBRoad, ALDREN, X-tendo, and EUB SuperHub have already concluded, while BUILDCHAIN and OneClickRENO are still running into 2026. Two are academic or framework-level data-model studies, by Gómez-Gil et al. and the Ecorys EU DBL framework. The remaining three are Dutch tools that consume building data without being national BRPs or DBLs themselves: the *Hoomdossier*, a building dossier used by energy coaches rather than a government-issued passport; the EPA software by Vitec Vabi, used by

Dutch energy auditors to calculate EPC scores; and BuurtWarmteWijzer, a collective-heating decision-support tool for residents.

The field-level analysis of these 14 instruments, including which data fields each one carries and how those fields align across implementations, is the subject of the parallel Geomatics thesis, where they are synthesised into the MSRD that subsequently serves as the artefact prompt for the interviews in this thesis. The present section restricts itself to the presentation layer, since it is the presentation layer that Section 2.3.2 then weighs against the dominant drivers of Section 2.2.1. Of the 14 instruments, only a subset has a homeowner-facing presentation layer at all; the academic, framework-level, and back-office software entries either stop at the data-model level or address professional users, and are therefore not the focus of what follows.

The user-facing instruments in this set, the iSFP, *Woningpas*, *Cléa*, *Hoomdossier*, and the demonstrator output of OneClickRENO, converge on a recognisable architecture. The headline metric is the Energy Performance Certificate label, or an equivalent national scoring system, typically presented as a current-versus-projected pairing reinforced by the label-band colour palette of the national scheme. Performance is then disaggregated by building component (walls, roof, windows, heating, ventilation), with each component assessed for its contribution to overall energy performance and reported using a small set of energy-engineering metrics. The recurrent set comprises annual energy consumption in kilowatt-hours, avoided CO_2 emissions in kilograms per year, and primary energy use in kilowatt-hours per square metre per year, alongside the before-and-after label scores already noted.

Where a renovation-roadmap layer is present, as in the iSFP and the OneClickRENO demonstrator, it sequences these measures over a multi-year horizon with associated upfront cost figures per measure, though typically without payback periods. Charts and graphical elements concentrate on the label pair and the per-component breakdown. Comfort, indoor environmental quality, and quality-of-life implications, where they appear at all, are usually carried in body text or as qualitative icons rather than as quantified outputs comparable to the engineering metrics.

A complementary level of convergence is documented in the wider literature, even though that literature does not always look at the same layer. In Sesana and Salvalai [11], the three then-ongoing BRP initiatives in Flanders, France, and Germany are reported to converge methodologically, that is, on a combination of on-site energy audits, quality criteria, and dialogue-based customer engagement, rather than on a single visual template. In Karami et al. [35], a semantic-mapping comparison of seven building-data models reports convergence on a common set of data categories, including identification, envelope, technical systems, and energy performance, which underpins the per-component reporting structure observed at the presentation layer above.

2.3.2. Misalignment between owner-occupier drivers and current tool emphasis

The two primary drivers identified in Section 2.2.1, improving thermal comfort and saving on energy bills, are not the metrics that the BRP-style tooling described in Section 2.3.1 is built around. Two problems with this metric emphasis are visible in the literature. The first is one of priority. Although climate concern is the third-most-cited single driver row in Table 4 (11 of 29 sources) and is not absent from the picture, energy performance and CO_2 reductions sit consistently below the two drivers of comfort and bills, and are typically reported as co-benefits rather than primary motivators [59, 71–73].

The second problem concerns the legibility of the metrics themselves. In a discrete-choice study of 2,484 Slovenian homeowners by Jovović et al. [91], energy literacy is reported as very low, and presenting information in monetary terms rather than kilowatt-hours per square metre does not significantly improve respondents' choices, with trust in the energy performance certificate emerging as the decisive factor. In the survey-based study of carbon innumeracy by Grinstein et al. [92], respondents are reported to underestimate the CO_2 emissions of everyday activities by roughly a factor of four, and to do so regardless of which unit (pounds, kilograms, grams, or tonnes) they are allowed to choose for their answer. The two findings cut in the same direction: reframing engineering metrics into another quantitative unit does not, on its own, make them actionable for homeowners.

What the drivers literature points to, conversely, is largely absent from the current tooling. Indoor thermal comfort improvements are rarely quantified, and where they appear at all they tend to be carried in body text. Energy-bill changes before and after renovation are reported only occasionally, even though upfront costs per measure or per step are routinely included. Payback periods are usually not given.

The diagnosis is, therefore, that the dominant information architecture of existing BRP-style tooling is poorly aligned with the dominant motivations of the owner-occupiers it is meant to serve, regardless of how technically accurate that architecture is. A BRP aimed at Dutch owner-occupiers will need to translate, or at least supplement, the engineering metrics with comfort and cost framings that match what homeowners report as their actual reasons to renovate, and will need to do this in a way that builds rather than presupposes trust.

2.3.3. Implications for a Dutch BRP

The EU BRP-style tooling reviewed in Section 2.3.1 shares a focus on engineering metrics that the renovation literature of Part 2 does not place at the centre of the homeowner perspective. Part 2 can also be read in the other direction, as a set of implicit requirements that any Dutch BRP must satisfy. Four strands emerge from that reading.

The first strand is the metric/driver misalignment developed in Section 2.3.2. A Dutch BRP that presents only label scores, kWh/m^2, and avoided kilograms of CO_2 does not speak to the two motivations that the literature places at the top of the homeowner list. Translating those engineering figures into comfort and bill outcomes is therefore not a cosmetic concern; it is the precondition under which the rest of the document is read at all.

The second strand follows from the barrier clusters of Section 2.2.1. A BRP is an information instrument, so it acts mainly on the informational and professional-trust sub-barriers (uncertainty about returns, about which measures to take and in what order, and about installer reliability) rather than directly on the financial or hassle barriers, which sit largely outside its remit. This bounds what a BRP can be expected to achieve, and bears on the misalignment in the previous strand. Where a homeowner is willing to act but does not know how, a BRP can help. Where the obstacle is the upfront cost itself, no document changes that.

The third strand is the decision-making-stages reading of Section 2.2.2. The reviewed studies converge on a multi-stage journey with severe early-stage attrition, with only a small minority of homeowners reaching implementation. A document used at the orientation stage and a document used at the contracting stage are not the same artefact, even when the underlying building data is identical. The same BRP content must therefore be readable at multiple depths along the journey, rather than presented in a single technical register.

The fourth strand follows from the stakeholder roles of Section 2.2.3. The Dutch literature on owner-occupier renovation does not describe the homeowner as reading a BRP alone, but as receiving advice through energy coaches, auditors, municipal channels, one-stop shops, and installers, each of whom carries a different level of perceived independence. The trust a BRP commands depends on which actor presents it. It follows that who is authorised to enter information into which fields is as much a design decision as the choice of fields themselves.

3. Methodology

3.1. Research design overview

The objective of this research is to identify the building-data needs of the stakeholders who advise Dutch owner-occupiers on energy renovation towards an emission-free home, and to elicit the practical expectations and concerns these stakeholders would have of a national Dutch BRP.

The study adopts a qualitative, exploratory design centred on semi-structured interviews with practitioners from the Dutch residential renovation sector. The methodological sequence is structured in three steps:

1. **Identifying the stakeholder domains** (Section 3.2): narrowing the set of stakeholders who advise Dutch owner-occupiers on energy renovation, and deriving the definitions used to recruit and contextualise interviewees.
2. **Semi-structured interviews** (Section 3.3): deriving interview goals from the research questions and Step 1, designing a semi-structured protocol, and conducting interviews with the identified stakeholder groups.
3. **Eliciting reactions to a hypothetical Dutch BRP**[4] (Section 3.4): using the parallel-Geomatics MSRD-based data-model proposal as a concrete artefact shown to each interviewee to draw out practical expectations, concerns, and missing elements.

The interview material is then analysed thematically in ATLAS.ti using a layered deductive-inductive codebook (see Section 3.5), and the findings are synthesised in Chapter 4. Figure 3.1 summarises the full sequence.

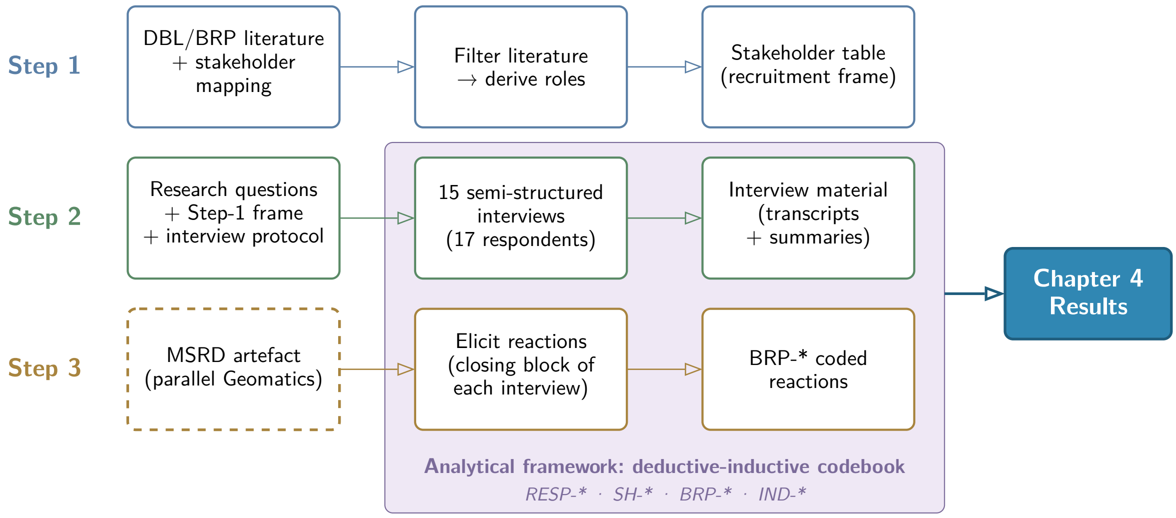


Figure 3.1: Research design. Own work.

[4] Throughout this thesis the term "Dutch BRP" refers to the conceptual *gebouwrenovatiepaspoort* as discussed in the literature and elicited in the interviews: a structured, data-rich roadmap and data repository. This is distinct from the high-level, one-pager BRP currently being prepared by BZK, which does not contain data fields or a place to store building information. Where the BZK document is meant, this is stated explicitly.

3.2. Step 1. Identifying the stakeholder domains

Step 1 narrows the stakeholder field to the specific roles that advise Dutch owner-occupiers on energy renovation. The substantive per-stakeholder synthesis and the literature filter that produced it (including the four inclusion criteria, the starting pool of roughly 25 papers, and the cross-mapping of which paper identifies which stakeholder) sit in the literature chapter (Section 2.2.3 and Table 6). This section reports only the resulting recruitment frame and one inductive role added later during coding.

3.2.1. Recruitment frame

The roles identified by the filter, summarised in Table 7, define the recruitment frame for Step 2. One additional role (`SH-INTERMEDIARY`, knowledge brokers such as Milieu Centraal, Vereniging Eigen Huis, the *Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek* (TNO, Dutch Organisation for Applied Scientific Research), and citizen panels) was added inductively during coding once it became clear that knowledge-broker actors recurred in respondents' accounts but did not map onto any canonical literature role; the promotion is documented in the data analysis (Section 3.5).

Role	Recruitment-relevant scope
EP-advisor / energy auditor	Certified and uncertified professionals giving in-person, technical advice on energy measures.
Municipality / local government	Public-sector advice, programme coordination, financial facilitation, neighbourhood-level outreach.
Installer / contractor	Technical professionals implementing renovation measures; primary information source in practice.
Social network / energy ambassador	Peer residents (neighbours, friends, family) who share renovation experience; ambassadors as a more active form.
Online tool / digital platform	Information sites, comparison platforms, and cost calculators used by homeowners.
Energy / heat supplier	Commercial energy or district-heat providers serving residential customers.
Government info agency	Public intermediaries providing objective technical or financial information (RVO, Milieu Centraal).
One-stop shop	Integrated service models bundling advice, implementation, and financing.
Construction store / DIY	Building-materials retailers used by homeowners as a primary information source.
Intermediary / knowledge broker*	Knowledge-broker organisations (Vereniging Eigen Huis, TNO, citizen panels, umbrella organisations) added inductively during coding.

Table 7: Stakeholder roles derived from the literature filter (9 of ~25 papers passed all four criteria). * Inductive addition identified during interview coding (see Section 3.5). Per-stakeholder source evidence and full characterisations are in Section 2.2.3. Own work.

In Dutch practice, several of these roles are further compartmentalised. The EP-advisor / energy-auditor role in particular splits into (i) certified EP-advisors who can issue EPC labels, (ii) uncertified but professional advisors and consultants, and (iii) voluntary energy coaches and energy desks (*energieloketten*) that operate on a non-commercial basis. Where this fragmentation matters analytically, it is captured per excerpt by the `RESP-*` and `SH-*` codes (see Section 3.5) rather than by maintaining separate literature-defined and Dutch-practice columns in the table above.

3.3. Step 2. Semi-structured interviews

3.3.1. Interview goals and protocol design

The interviews address the three sub-questions stated in Section 1.6. SQ1 asks which stakeholders advise Dutch owner-occupiers, against the recruitment frame derived in Section 3.2. SQ2 asks which building data they require in practice and at what level of detail, including current sources, reliability, and gaps. SQ3 asks for their practical expectations, concerns, and missing elements when confronted with a concrete hypothetical Dutch BRP, the Step-3 artefact described in Section 3.4.

The protocol is semi-structured to cover these three sub-questions consistently while leaving room for stakeholder-specific detail. Topics include the interviewee's typical workflow, the specific data they require, current data sources and gaps, and, in the closing block, their reactions to the Step-3 artefact. The full interview protocol (English version) can be found in Appendix A.

3.3.2. Rationale for semi-structured interviews

The literature review identified *which* stakeholder groups are involved in providing renovation advice, but does not specify *what* building data each of these groups actually needs in practice, nor at what level of detail. Most studies refer generically to "stakeholders" or "professionals" without differentiating which ones, let alone their specific data needs. Semi-structured interviews were selected as the method best suited to bridge that empirical gap. They allow stakeholder-specific elicitation and leave room for unanticipated themes to emerge, which a fully structured questionnaire would have foreclosed by presupposing the very data taxonomy this thesis is trying to elicit. A fully open narrative format, on the other hand, would have made cross-interview comparison difficult given the heterogeneous sample and the nine stakeholder categories the analysis has to cover. The semi-structured format also supports the closing-block prompt for Step 3 (Section 3.4), where a concrete artefact is shown identically to every interviewee and free-form reactions are then elicited; this combination requires both a consistent stimulus and an open response.

3.3.3. Participant selection and recruitment

Participants were selected to cover the stakeholder groups identified in Step 1, aiming for at least two representatives per category where feasible to support within-group comparison. Recruitment combined the supervisory network, the RenoDAT project context, personal contacts, and snowball sampling from earlier interviewees. In total, 15 semi-structured interviews with 17 respondents were conducted across nine stakeholder categories (see Table 8). One interview (with a contractor) was held as a group conversation with three employees of the same firm; these three participants all spoke from the same contractor role and are therefore reported jointly in a single row of the table. To protect respondent anonymity, participants are referred to by code (P01 through P17) throughout this thesis; names, organisation names, and specific job titles are withheld or generalised.

This recruitment route carries an obvious selection bias toward stakeholders already engaged with (or positive about) building-data digitalisation. The implications of this bias for the findings are discussed in the limitations (Section 5.4).

Code	Stakeholder group	Sector
P01	Homeowner	Private
P02	*Energieloket*	Public-funded
P03	Government (national)	Public
P04	Government (national)	Public
P05	Homeowner / Private landlord	Private
P06	Energy advisor / energy coach	Non-profit
P07	Energy advisor / energy coach	Private
P08	Government (municipal)	Public
P09	Energy advisor / energy coach	Non-profit
P10	Contractor / installer	Private
P11	Government (national)	Public
P12	Government (municipal)	Public
P13-P15	Contractor / installer	Private
P16	Citizen initiative	Non-profit
P17	Energy cooperative	Non-profit

Table 8: Participant overview. Respondents are referred to by codes P01 to P17 throughout the thesis. Their names, organisation names, and specific job titles are withheld or generalised. Own work.

Several interviewees carry more than one role in practice. One respondent is simultaneously a homeowner, a private landlord, and an architect; another combines an energy-advisor role with architectural practice; a third combines an energy-advisor role with directing a foundation that supports homeowners' association renovations. These overlaps are retained in the coding (see Section 3.5) because they reflect how roles actually co-occur in Dutch practice rather than an inconsistency in recruitment.

Owner-occupiers are a heterogeneous group from which it is difficult to draw representative claims, especially at this sample size. The two homeowner respondents (P01, P05, with P05 also acting as a private landlord) were spoken to in order to capture the demand-side perspective alongside the professional sample, not as a cross-section of Dutch owner-occupiers or private landlords. On top of that general caveat, both are atypical in the same direction relative to a regular Dutch owner-occupier. Both work professionally in the built environment, which predisposes them to a level of building- and renovation-related knowledge that the average owner-occupier (likely) does not have. P01 is an engineer with a pioneer-adopter renovation history, and P05 is a practising architect who is also a private landlord with an extensive rental portfolio. Their accounts are reported as case material throughout the analysis, distinct from the professional-stakeholder rows; the implications of this for the findings are discussed in the limitations (Section 5.4).

Interviews took place between March 16, 2026 and April 30, 2026, were conducted either online (via Microsoft Teams) or in person, and typically lasted 60-90 minutes.

3.3.4. Interview language and recording

Interviews were conducted in Dutch, with one exception held in English. Audio was recorded on the researcher's mobile phone, deliberately to keep recordings local rather than uploading them to a third-party server or cloud transcription service whose audio handling would be opaque to the respondents and to the researcher. Each recording was then transcribed through a locally hosted pipeline built on top of OpenAI's WhisperX, made publicly available on GitHub[5]. Based

[5]github.com/DaanSchlosser/whisperX-pipeline

on these transcriptions, summaries of five to seven pages were written, with great care to be objective and complete with respect to what was discussed and the nuances raised. Only off-topic material such as small talk and interjections from outside the conversation (audio issues, a colleague stepping in) was filtered out; the summaries are not filtered against the research questions and therefore preserve material that may not be directly useful for the analysis but supports the chain from utterance to coded excerpt. Each summary was then sent to the respondent for review, and any corrections were applied before it was admitted to the analysis.

3.4. Step 3. Eliciting reactions to a hypothetical Dutch BRP

The artefact used in Step 3 is the MSRD-based data-model proposal developed in the parallel Geomatics thesis (see Section 1.9). It is a concrete, field-level data model derived from 14 existing and proposed DBL/BRP initiatives and mapped onto the CityGML 2.0 + Energy ADE 3.0 data model.

3.4.1. Artefact shown to interviewees

In the present thesis this artefact is used as a prompt in the closing block of each interview. The same setup was used in every interview: the artefact was screen-shared from the researcher's laptop, either through Microsoft Teams (for online interviews) or directly (for in-person interviews, where the researcher brought a laptop along).

The data model was shown live in the open-source KITModelViewer[6], which renders a CityGML/Energy ADE file as a navigable hierarchical tree alongside the associated geometry. Two artefact instances were shown in sequence in every interview. First, a CityGML file of a single owner-occupier dwelling, populated for the parallel Geomatics depth case, was shown initially *without* the geometry rendered (Figure 3.2), so that interviewees could see how building information is organised hierarchically (building → element → attribute) and that many fields are optional rather than required. The geometry was then revealed as an additional layer (Figure 3.3), to make clear that the data model can store both attribute and geometric information without forcing a particular usage. Second, a small-area CityGML model of part of the village of Emmer-Compascuum was shown (Figure 3.4), to demonstrate that the same data model can scale beyond a single building to neighbourhood and city stock. Both artefacts were built by the researcher for the parallel Geomatics thesis.

[6]KITModelViewer is an open-source CityGML viewer developed at the Karlsruhe Institute of Technology (KIT). iai.kit.edu/english/1648.php.

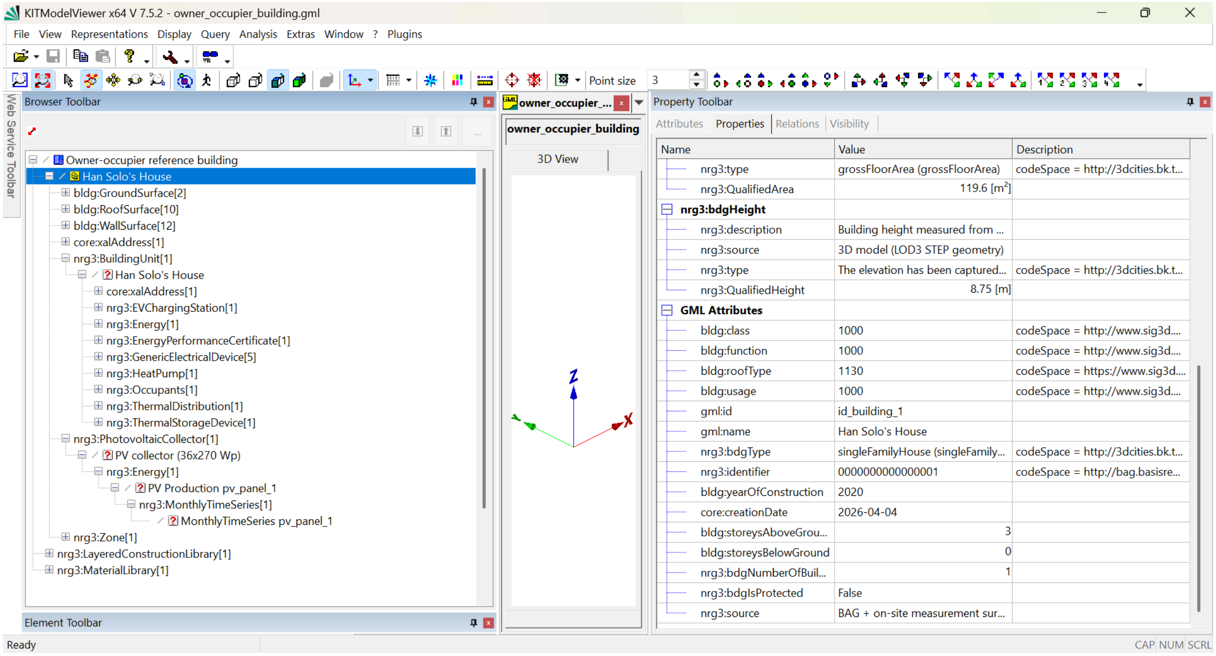


Figure 3.2: Owner-occupier reference dwelling in KITModelViewer, with the CityGML/Energy ADE tree expanded on the left and the 3D geometry hidden. This view foregrounds the hierarchical organisation of the data (building → element → attribute) and the fact that many fields are optional. Screenshot of KITModelViewer (KIT); model by the author.

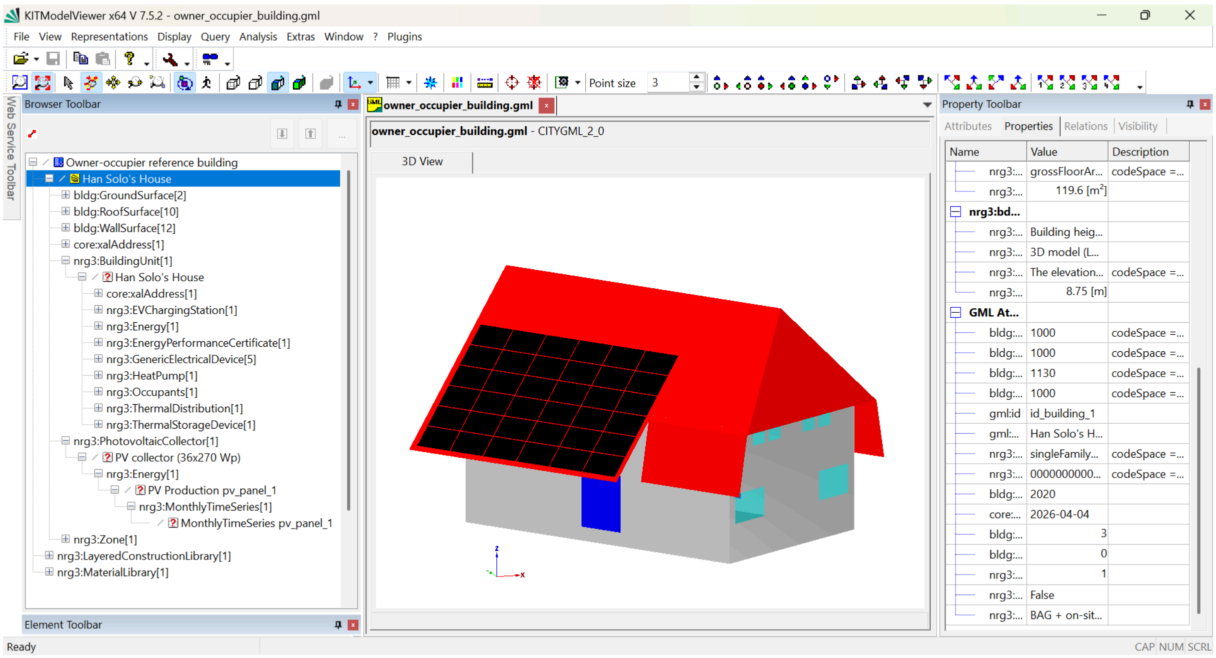


Figure 3.3: The same file as Figure 3.2 with the geometry layer revealed. This view shows that attribute information and geometric information coexist in the same CityGML/Energy ADE file. Screenshot of KITModelViewer (KIT); model by the author.

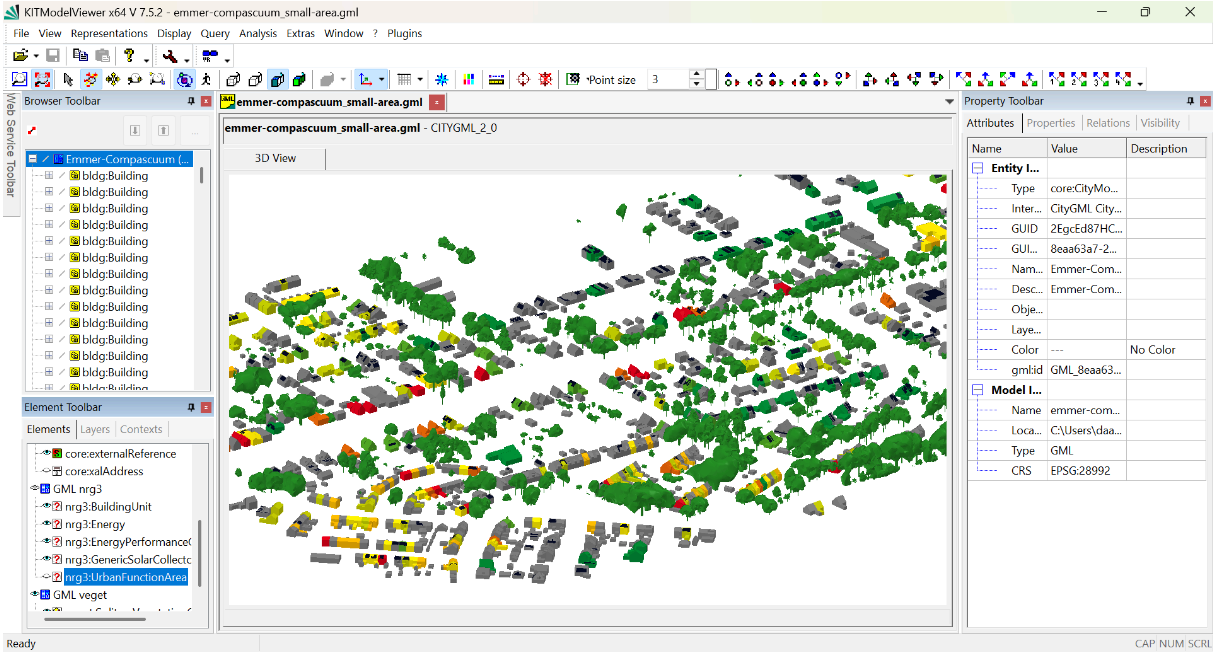


Figure 3.4: Small-area CityGML model of part of the village of Emmer-Compascuum, built by the researcher for the city-scale stream of the parallel Geomatics thesis (see Section 1.9). The artefact illustrates that the same data model scales from a single building to a neighbourhood or city-wide stock. Screenshot of KITModelViewer (KIT); model by the author.

Throughout the demonstration the researcher answered questions about what individual fields meant and gave concrete examples (for instance, that an attribute on a solar panel records its orientation, which the model can then relate to expected production), but stayed away from technical detail about query languages, schema implementation, or coding. The intent was to make clear what the model can *do* and *store*, not how it is built.

3.4.2. The elicitation prompt

During this demonstration, each interviewee was asked the same broadly framed question:

> *"If this tool existed and you had access to it, how would it affect your process: positively, negatively, where would it help you, and where would you see concerns?"*

Probes were added depending on whether the interviewee had already raised related themes earlier in the conversation (for example privacy, commercial sensitivity, data quality, or accessibility for laypeople). The intent of the prompt was to elicit reactions broadly generalisable across data-model proposals, namely trust, privacy, commercial interests, prices, quality, accessibility, and adoption.

3.5. Data analysis

The interview material is analysed thematically in ATLAS.ti through four analytical themes (three aligned with the sub-questions, plus one for respondent attribution) together with a cross-cutting set that captures themes spanning sub-questions. The coding combines a deductive backbone drawn from the literature with inductive openness to patterns that recurred during the first pass but did not fit any deductive code. The coding is applied to the respondent-validated summaries described in Section 3.3, so the analytical material is a member-checked interpretive layer. The codebook is reproduced in full in Appendix B.

The analysis is done in three steps. Step 1 applies first-order codes to individual excerpts and separates speaker attribution from topical attribution. Step 2 aggregates those first-order codes into per-sub-question second-order readings (a stakeholder coverage table for SQ1, a three-axis cross-tab for SQ2, a per-dimension synthesis for SQ3). Step 3 then synthesises those per-sub-question readings into the five higher-order themes that organise Chapter 4. The remainder of this section describes each step in turn, names what each step lets the analysis see, and closes with a forward-pointer to how Chapter 4 reports the outputs.

3.5.1. Step 1: First-order coding

The first-order scheme has four substantive layers plus one cross-cutting set. Three of the substantive layers are aligned with the sub-questions:

- the stakeholder-as-topic layer (`SH-*`) records *whose role is being discussed* and answers SQ1;
- the building-data-needs layer (`DN-*`) records *which data, from which source, at which level of detail* and answers SQ2;
- the BRP-expectations layer (`BRP-*`) records *which practical expectations or concerns arise about a Dutch BRP* and answers SQ3.
- The fourth substantive layer, the respondent-attribution layer (`RESP-*`), records *who is speaking* and is kept analytically separate from the three topical layers.
- The cross-cutting set (`X-*`, `BARRIER-*`) flags themes that span sub-questions, including motivation, policy and regulation, pioneering behaviour, collective approach, liability, and a four-way typology of barriers (supply, demand, regulatory, data).

The separation between `RESP-*` and `SH-*` matters analytically because respondents constantly speak about stakeholders other than their own. An advisor describes homeowners; a municipality describes contractors; a citizen initiative describes both. Conflating *who said it* with *who they are talking about* would not allow for the desired cross-stakeholder picture. The `DN-*` layer is itself structured in sub-layers (broad categories plus specific field, source, and spatial-level specialisations) so that the SQ2 reading can later operate at the level of detail respondents themselves use (see Appendix B for the full sub-layer list).

The deductive backbone of every layer is fixed before any interview is coded. The `SH-*` set is derived from the stakeholder filter applied to the DBL/BRP literature and the prior mapping by Hwang [88] (see Section 3.2). The `DN-*` set is drawn from the field groupings of the Dutch energy-performance determination method (NTA 8800), the EPBD recasts III and IV, and the building-data taxonomies recurring in the DBL/BRP literature. The `BRP-*` set is drawn from the practical-concern dimensions that recur in the DBL/BRP literature. These are trust, privacy, completeness, update mechanism, standardisation, integration, accessibility, usability, adoption, and roadmap actionability. The `X-*` set is drawn from the renovation-decision and diffusion-of-innovation literature.

Inductive promotions were made during the first coding pass when a theme recurred in three or more interviews and did not fit cleanly under any deductive code. The codebook was then provisionally frozen and re-applied to all 15 interviews. What Step 1 produces analytically is an excerpt-level evidence base in which the same utterance can be read against multiple sub-question themes without conflating who is speaking with whose role is being discussed. This is what later lets Step 2 ask sub-question-shaped questions of the data. The deductive baseline and the inductive extensions per layer are listed in Table 9.

Deductive baseline (literature anchor)	**Inductive extensions added during coding**
SH-* (stakeholder roles)	
Stakeholder filter applied to the DBL/BRP literature plus the prior mapping by Hwang [88], narrowed to 9 papers from a starting set of ~25 (see Section 3.2). Initial roles: homeowner, EP-advisor / energy auditor, municipality, contractor / installer, social network / energy ambassador, online tool / digital platform, energy / heat supplier, government info agency, one-stop shop, construction stores / DIY.	SH-COACH split from SH-ADVISOR (volunteer energy coach distinguished from paid certified advisor). SH-GOV-NAT and SH-GOV-MUN split from a single SH-GOV once the national/municipal axis became analytically central. SH-VVE and SH-CORP split (collective owner-occupiers vs. housing corporation). SH-NETWORK, SH-TOOL, SH-UTILITY promoted from the literature pool. SH-INTERMEDIARY added when knowledge brokers (Milieu Centraal, Vereniging Eigen Huis, TNO, De Twee Snoeken, citizen panels, umbrella organisations) repeatedly did not map onto any canonical role.
DN-* (data needs)	
Field groupings of the Dutch energy-performance determination method (NTA 8800), the EPBD recasts III and IV, and the building-data taxonomies recurring in the DBL/ BRP literature. Initial categories: geometry & envelope, construction & materials, energy performance, installations, consumption & metering, behaviour, comfort, costs, history, neighbourhood context, plus quality and source.	DN-GRANULARITY added: explicit talk of *at what level of detail* data is required, present in almost every interview and aligned with the "level of detail" component of SQ2. DN-METHOD added: methodological infrastructure (NTA 8800, attested software, default values, validated calculation protocols), distinct from the performance outputs captured by DN-PERF. Three specialisation axes added after the first pass: 14 DN-F-* field codes (e.g. DN-F-YEAR, DN-F-INSUL, DN-F-UVAL, DN-F-LABEL), four DN-S-* source codes (BAG, EP-Online, Kadaster, building drawings), and five DN-L-* spatial-level codes (dwelling, block, neighbourhood, municipal, national/EU).
BRP-* (BRP expectations)	
Practical-concern dimensions recurring in the DBL/BRP literature: trust, privacy, completeness, update mechanism, standardisation, integration with existing systems, accessibility, usability, adoption, and roadmap actionability.	BRP-COMM added: commercial sensitivity (offer prices, supplier data, proprietary analyses), distinct from personal privacy (BRP-PRIVACY). BRP-COSTBRP added: cost of the BRP itself (who pays, who is priced out), distinct from general cost data (DN-COST). BRP-EPBD and BRP-ZEB added as policy anchors recurring as separable concerns: explicit references to the EPBD recasts and to the zero-emission-building target toward which the roadmap points.
X-* (cross-cutting)	
Renovation-decision literature and diffusion-of-innovation work: motivation/driver (X-MOTIV), barrier/obstacle (X-BARRIER), policy/ regulation (X-POLICY), pioneering / early adopter (X-PIONEER).	X-COLLECTIVE added: district-level and homeowners'-association-level approaches positioned as alternative to individual advisory trajectories (district approach, neighbourhood approach, collective procurement). X-LIABILITY added: formal legal or financial accountability (the *Autoriteit Financiële Markten* (AFM, Dutch Authority for the Financial Markets) permit boundary on financial advice, performance guarantees, registered floor area as exposure), distinct from BRP-TRUST which concerns credibility rather than legal responsibility. Four BARRIER-* subtypes promoted underneath X-BARRIER (supply, demand, regulatory, data) once it became clear the generic flag hid four different problem types.

Table 9: Deductive baseline and inductive extensions per codebook layer. Own work.

3.5.2. Step 2: Per-sub-question second-order synthesis

In Step 2 the first-order codes are aggregated along sub-question lines to produce three second-order readings, each shaped by what its sub-question asks of the data so that the coverage table, the cross-tab and the per-dimension synthesis speak directly to the research questions. This mapping is summarised in Table 10.

SQ	Layer(s) used	Aggregation	Interpretive output
SQ1	SH-* (topic) read against the empirical distribution of RESP-* (speaker).	Stakeholder coverage table, with RESP-* distribution as a reality check on the literature-derived SH-* set.	Where practitioner discourse aligns with the canonical advice-giving roles, and where it diverges; the divergence motivated the addition of SH-INTERMEDIARY plus the inductive splits and literature-pool promotions documented in Table 9.
SQ2	DN-* categories with three specialisation axes: DN-F-* (specific fields), DN-S-* (specialising DN-SOURCE), DN-L-* (specific spatial level, under the DN-GRANULARITY umbrella).	Three-axis cross-tab of RESP-* against DN-F-*, DN-S-*, and DN-L-*, with parent-code suppression to avoid double-counting.	Per-role data-needs picture at the level of detail respondents themselves use: which fields, from which sources, at which spatial level (see Table 12 and Table 13 in Section 4.3).
SQ3	BRP-* set, complemented by the cross-cutting X-* codes.	Per-BRP-*-dimension synthesis of expectations, concerns, and missing elements elicited by the MSRD-based artefact.	Per-theme reading of BRP expectations and concerns, with policy anchors (BRP-EPBD, BRP-ZEB) and the practical concerns recurring in the DBL/BRP literature kept as separable dimensions.

Table 10: Per-sub-question second-order readings produced from the first-order codes. Own work.

What the SQ1 reading lets the analysis see is which practice-side actors the literature filter does not name, most visibly the knowledge-broker role captured by SH-INTERMEDIARY and the volunteer energy-coach role split inductively from the certified-advisor code (SH-COACH from SH-ADVISOR). Two caveats travel with this reading. First, SH-HOMEOWNER tags how *professionals* talk about homeowners as a class, not direct homeowner self-reports. Second, the two demand-side respondents (P01, and P05 in their homeowner role) and the single private-landlord case (P05) are atypical and are reported as case material rather than as evidence about owner-occupiers or private landlords as a class.

The three orthogonal specialisation axes of the SQ2 reading work as follows. DN-F-* records the 14 specific fields respondents name, ranging from construction year and insulation through U-values and energy label to ventilation and heating systems. DN-S-* records the four specific sources they invoke (BAG/3DBAG, EP-Online, Kadaster, and the building drawings held in the municipal archive). DN-L-* records the spatial level at which a stakeholder operates, from per-dwelling through block, neighbourhood, municipality, to national or EU. One caveat travels with this reading: only a minority of excerpts name a spatial level explicitly, so the DN-L-* counts describe asymmetries in how explicitly each role talks about level, not a quantitative basis for “stakeholder X works at level Y” claims.

The cross-cutting X-* codes complement the SQ3 reading by recording the motivational, policy, pioneering, collective-action, and liability themes through which respondents discuss the same artefact. The two thesis-specific policy anchors BRP-EPBD (the directive that mandates a Dutch BRP) and BRP-ZEB (the zero-emission-building target the roadmap aims at) are kept as separable dimensions from the rest of the BRP-* set so that Theme 4 can read expectations against the policy frame.

3.5.3. Step 3: Higher-order thematic synthesis

What Step 3 produces analytically is the move from per-sub-question readings to cross-cutting patterns, four of which were already named by the deductive literature and one of which collects inductive patterns the literature did not predict. The mapping is summarised in Table 11. Theme 1 (stakeholder goals, outputs, and data needs) and Theme 2 (current data sources and reliability) both draw on the SQ1 coverage reading and the SQ2 cross-tab.

- Theme 1 is organised around the chain from each stakeholder's individual goal to their output to the input data they therefore need. It spans the professional roles, homeowners and landlords (both as topics of professional discussion and as the two demand-side cases), and the tool-mediated capture cases (e.g. Hoomdossier). It also covers the contested-zone data needs (cost, behaviour, and comfort) that sit at the edge of what standard performance accounting captures.
- Theme 2 zooms in on the specific sources practitioners use (BAG/3DBAG, EP-Online, Kadaster, and the building drawings held in municipal archives) and the trust they place in them. Reliability is read through the fields that recur most often in source-quality discussion (energy label, construction year, and insulation).
- Theme 3 (data sharing, storage, and handover) reads current-practice exchange patterns through privacy, the commercial value of internally-held data, and the granularity mismatch between actor levels. These are read against the policy frame and the liability boundary set by the AFM permit on financial advice.
- Theme 4 (reactions to the MSRD-based artefact) is the SQ3 reading itself. The policy frame, the question of who pays for a BRP, and the execution-gap concern about supply-side capacity to deliver renovations are kept as separable dimensions alongside the practical expectations drawn from the literature.
- Theme 5 (inductive themes) collects the two themes that recurred across three or more interviews and were promoted into the codebook. These are the social-network channel as a parallel adoption lever beyond the canonical professional roles, and the collective-and-district-level approach as a counter-frame to the individual-advice trajectory implied by the BRP literature. A separate cross-cutting renovation-history reading is reported in Section 4.2.

Higher-order themes	Contributing first-order code groups
T1. Stakeholder goals, outputs, and data needs	RESP-*; SH-COACH, SH-ADVISOR, SH-OSS, SH-CONTRACTOR, SH-GOV-NAT, SH-GOV-MUN, SH-CORP, SH-VVE, SH-TOOL, SH-HOMEOWNER, SH-LANDLORD; broad DN-*, DN-COST, DN-BEHAV, DN-COMFORT, DN-METHOD; X-MOTIV, X-LIABILITY, X-PIONEER.
T2. Current data sources and reliability	DN-S-BAG, DN-S-LABEL, DN-S-KADASTER, DN-S-DRAWINGS; DN-F-LABEL, DN-F-YEAR, DN-F-INSUL; DN-SOURCE, DN-QUALITY, DN-METHOD.
T3. Data sharing, storage, handover	DN-COST, DN-SOURCE, DN-GRANULARITY; BRP-PRIVACY, BRP-COMM; X-LIABILITY, X-POLICY.
T4. Reactions to the MSRD-based artefact	BRP-*, BRP-EPBD, BRP-ZEB, BRP-COSTBRP; X-POLICY; BARRIER-SUPPLY.
T5. Inductive themes	SH-NETWORK; X-PIONEER, X-COLLECTIVE.
Cross-cutting renovation-history reading (Section 4.2)	DN-HISTORY, BARRIER-DATA.

Table 11: Higher-order themes (Step 3), the cross-cutting renovation-history reading, and the first-order code groups (Step 1) that feed each through the per-sub-question readings of Step 2. Own work.

A deliberate design point of the three-step structure is that no excerpt is forced into a single theme. An excerpt can carry one SQ code (most frequently SQ2), it can carry codes from two SQs at once when a respondent links data needs to BRP expectations, and it can additionally carry one or more cross-cutting flags. The five-theme synthesis of Chapter 4 therefore reads horizontally (per theme) as well as vertically (per sub-question), and the same excerpt can legitimately appear under more than one theme.

The outputs of these three steps feed into Chapter 4. The per-sub-question second-order readings of Step 2 underpin Themes 1 to 4; the cross-cutting patterns of Step 3 underpin Theme 5, the cross-cutting renovation-history reading (Section 4.2), and the cross-stakeholder information-requirements matrix (Section 4.3). The combination of a sub-question-aligned deductive backbone with inductive openness is what produces the practitioner-grounded picture the research questions ask for, namely what building data Dutch renovation advisors actually need and what they would practically expect of a Dutch BRP.

3.6. Ethical considerations

This study was approved by the TU Delft Human Research Ethics Committee (HREC) on May 13, 2026 (application 6799). The research was conducted consistent with the submitted Data Management Plan and the signed informed-consent forms, as described below.

3.6.1. Informed consent

All participants were informed about the purpose of the research, the personal data being processed, the intended use of their contributions, and their right to withdraw at any stage, and signed a written informed-consent form prior to the interview. Both Dutch and English versions of the consent form were available; respondents signed the version in the language of their preference.

3.6.2. Data management

Audio recordings were made on the researcher's mobile phone, transferred to TU Delft's secure Project Data Storage (U:) at the earliest opportunity, and deleted from the phone once transferred. Each recording was destroyed once the respondent had reviewed and approved the resulting summary. The signed consent forms and the anonymised summaries are kept on the U-drive for the duration of the project; personally identifiable contact data (name, email, phone) collected for administrative purposes is deleted at the end of the project.

3.6.3. Anonymisation

In this thesis, respondents are referred to only by anonymised codes (P01 to P17); names, organisation names, and any other identifying details have been withheld or generalised throughout the methodology and results chapters. All direct quotations from the interviews have been paraphrased or redacted to remove any identifying information.

3.6.4. Member checking

Each respondent was sent the interview summary written from their session and was given the opportunity to correct, retract, or amend any element before the summary was admitted to the analysis. Only summaries the respondent had agreed upon were used. The final thesis was likewise shared with the participants for review.

3.7. Research timeline

The research spans three TU Delft graduation quarters (Q6-Q8); Figure 3.5 shows the four work-streams and the four assessment milestones. A1 (January 22, 2026) is the formal green-light from which empirical work may begin; the preceding period was directed at problem framing and background reading. Chapters 1-3 were drafted in that pre-A1 phase and substantially rewritten once the empirical work was complete; the writing bars in the figure reflect the revision period only.

Additional interviews were added as new contacts emerged through the supervisory and RenoDAT networks, and some participants were only available later in the window. Coding began before the window closed; summary writing and first-pass coding on the early interviews ran in parallel with later recruitment, keeping the analysis from being compressed into the final weeks. The full coding pass under the frozen codebook was run on the 13 interviews then available and extended to all 15 once the final interview was held.

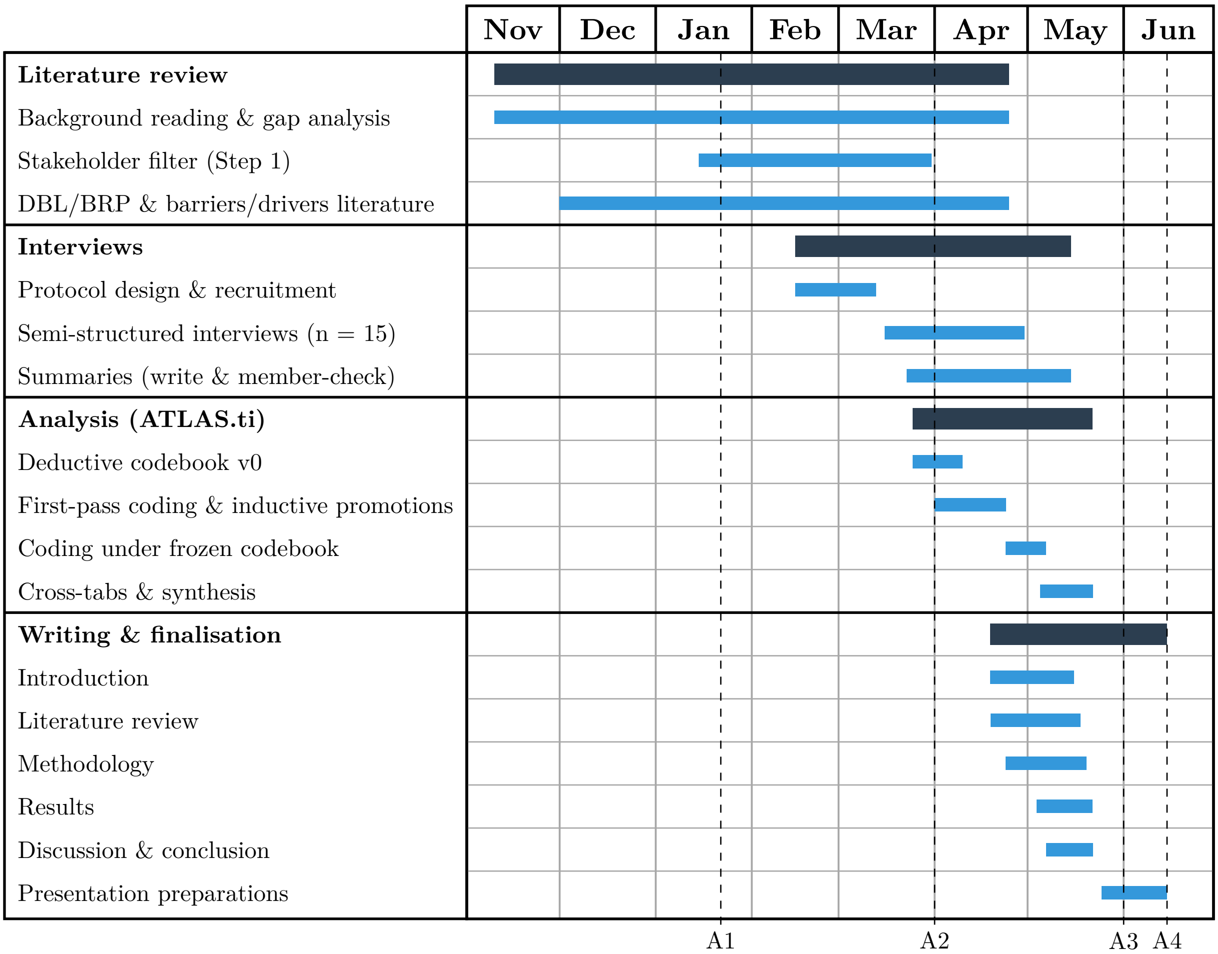


Figure 3.5: Research timeline. Interview dates are taken from the per-interview summaries; the first interview was on March 16, 2026, the last on April 30, 2026. Summary writing and the first ATLAS.ti coding pass overlapped with the interview phase. Milestones: A1 (January 22), A2 (April 1), A3 (June 1), A4 (June 15). Own work.

4. Results

This chapter reports the findings of the 15 semi-structured interviews described in Chapter 3. The chapter follows the layered coding scheme of Section 3.5, with findings organised per theme. Figure 4.1 gives a reading map of how the rest of the chapter is organised, annotated with the first-order codes from the layered codebook of Section 3.5 that feed each theme.

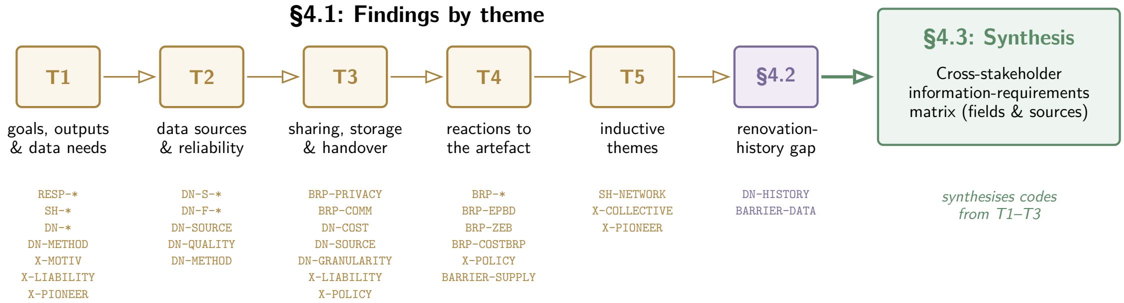


Figure 4.1: Reading map for this chapter. §4.1 reports findings under five themes (T1–T5); §4.2 reports the closing cross-cutting finding on the renovation-history gap; §4.3 synthesises Themes 1–3 into two cross-stakeholder matrices. The row below each theme lists the codes used per theme. Own work.

4.1. Findings by theme

4.1.1. Theme 1: Stakeholder goals, information they provide, and data they need

For each grouping the narrative below moves from the stakeholder's individual goal in advising or executing renovation, to the output they aim to provide, to the input data they therefore need, and at what level of detail.

Energy advisors and one-stop shops

The output advisors and one-stop shops aim to provide is a measure-level recommendation, scoped to what the resident or contractor will then act on, with a boundary that is principled rather than stylistic. These two roles are grouped together here because both produce measure-level recommendations from a kitchen-table intake; P02 is in the formal sense an OSS manager whose firm runs the *energieloket* kitchen-table service (with EPA-trained but not BRL 9500-MWA-W certified staff exercising the intake), while P07, P09, and P17 sit on the advisor side. P02 separates "advice at measure level" (what to do) from "information at material level" (what options exist), and leaves material choice to the resident or contractor. The same logic sits behind the AFM-permit boundary on financial advice, the licence required to advise on financing rather than only inform (`X-LIABILITY` n=21). P07, P09, and the cooperative chair P17 take essentially the same line, and the data in this group is comparatively narrow as a result. P02 puts it most directly:

> Actually, the only data we really use is the construction year, via the BAG. The rest you ask of the resident.
>
> (P02, paraphrased)

From the construction year plus a flat-area envelope measurement, an indicative insulation baseline is inferred and combined with on-site visual inspection. The energy label is used opportunistically, mostly for glazing, component areas, and existing insulation status. Coverage is limited to recently transacted dwellings, and label data quality is treated sceptically across this group on multiple grounds: P02 explicitly distrusts the pre-2023 self-filled labels, and P16 states the strongest version of the historical-pollution critique in Section 4.1.2 (`DN-F-LABEL` n=62; `DN-F-INSUL` n=73; `DN-F-YEAR` n=15). A 3D representation adds little value at this scale; per-dwelling surface areas and material properties at measure level suffice (`DN-L-WONING` is the dominant level among advisors and OSS where any level is named explicitly).

The advisor end of the practice (P07, P09) needs a wider input set when the trajectory shifts from individual advice to collective scenarios for homeowners' association renovations or area-based programmes. P09 names geolocation, glazing areas, window types, daylight admittance, solar gain, internal heat loads, airtightness, installation values, and the layer build-up of building components as the inputs that feed the calculation tool when the project moves toward financial close and performance agreements with banks (`DN-PERF` n=24; `DN-METHOD` n=21). P07 frames the same principle in phase-dependent language, where early phases run on architectural drawings, visual inspection, and photographs, with depth of analysis and willingness to use destructive checks rising toward tender. The cost of inspecting every dwelling at scale forces sampling, in which a subset of dwellings is inspected in detail and its findings are taken as representative of the rest. P09 works toward a 30% sample with explicit attention to top, bottom, and corner units when the building has individual heating systems, and works at building level when the system is collective.

Two further data classes recur in this group's input but sit in a contested zone (`DN-COST` n=59; `DN-BEHAV` n=40; `DN-COMFORT` n=23). P02 elicits comfort complaints (draughts, cold and damp spots) and the resident's planning horizon as part of the kitchen-table conversation, and uses behavioural data to interpret high consumption rather than to flag the building fabric. P07 emphasises that residents need to "almost re-learn how to live" in a deeply renovated dwelling, so post-renovation behaviour and ventilation routines need to be considered in the decision. Two government respondents (P03, P04) state the opposite, that usage data is about the user rather than the building, and therefore stays out of EP-Online as a stored building-attribute, though P04 notes that usage data does enter the *maatwerkadvies* calculation itself.

Energy coaches

The energy coach (P06) is institutionally separate from the certified EP-*adviseur*, and describes themselves in those terms:

> [I am] a neighbour who happens to have a bit more of an idea about sustainability than you do, because we are slightly more steeped in it, have had some training, see a lot, and can therefore pass a lot of information on.
>
> (P06, paraphrased)

The codebook split between `SH-COACH` and `SH-ADVISOR` was promoted on this basis, supported by the role split between energy coaches and the cooperative as a whole reported by P17. The energy coach's output is an indicative pre-advice with the boundary explicitly drawn at the heat-loss calculation:

> But do you want to know for sure? Then have a heat-loss calculation done by a firm that is equipped for it.
>
> (P06, paraphrased)

The data the energy coach captures is structured by the Hoomdossier instrument[7] (`SH-TOOL` n=20), which the energy coach completes jointly with the resident before and during a kitchen-table visit. The fields it records map closely onto the OSS intake but go finer on resident-plus-device variables, ranging from construction period, dwelling type, and household composition through wall composition with materials and U-values, glazing, window frames, floor and roof insulation, heating system and cooking method, to the resident's priorities. When the resident does not know a value, the Hoomdossier falls back to vintage-based averages, and the energy coach is explicit that "unknown" is the only honest answer when neither invoices nor a visual inspection can resolve it. P06 places one methodological boundary on this practice, in that they do not measure surfaces themselves, because doing so would suggest a precision the volunteer energy coach role cannot deliver. P06 does, however, verify glazing codes against the resident's report, inspect the wall build-up visually and look under the floor when the crawl-space hatch is accessible. The quality of the resulting input therefore varies systematically with the cooperation of the resident, the survival of historical documents, and the inspectability of the dwelling.

Contractors and installers

The output contractors and installers aim to provide is a quotable, executable specification, that is, a measure with materials, dimensions, and a price the firm is willing to stand behind under insurance and subsidy rules. The data behind this output is more granular than at advisor level, and is sourced differently. P10 and the P13 to P15 contractor group describe an intake process that combines client-supplied building plans with an internal firm checklist matched to the type of work (e.g., general renovation, window-frame replacement, bathroom renovation, and extensions) and an on-site inspection with photographs and video. Historic energy consumption is not routinely requested. Because occupied dwellings cannot be opened destructively in the pre-phase, much of the estimation is "pure experience" (P10).

Existing building plans are unreliable even when they exist. P09 sets out the four-question test, asking whether a drawing is available, digitised, actualised, and matches the current state. In their experience the actual execution often diverges from the drawing, and P10 and the P13 to P15 group report the same. Several reasons drive this unreliability. Plans drawn at construction may not reflect later occupant-led changes. Expanded permit-free building rules mean that recent changes by neighbours are also not always documented in the municipal archive. And even an as-built BIM model handed over by a developer is, in the contractor experience of P13-P15, not actively reused by the receiving housing corporation, which migrates only the core fields into Excel. Paper archives are still used in practice. P10 illustrates this with a project in which glazing data and a 20-year-old fax were retrieved from the firm's own archive to cross-check new measurements (`DN-S-DRAWINGS` n=13, with 6 in the contractor group).

A finding distinctive to this group is that contractors document heavily to satisfy insurance, subsidy, and liability requirements, and those external demands often shape what is recorded more than the resident's explicit information need. P10 is direct on the point:

> The firm does not let only the explicit wishes of clients determine what is captured; external requirements around insurance, liability, subsidy, and future regulation sometimes have more influence on what information must be recorded than the direct information demand of the private client.
>
> (P10, paraphrased)

[7] The Hoomdossier is one of the 14 DBL/BRP initiatives reviewed in the parallel Geomatics thesis (see Section 1.9), where its full list of fields and features is documented as part of the MSRD synthesis.

This is a pattern the DBL literature reviewed in Chapter 2 would not predict from first principles, and is reported here as an empirical correction to the "data is recorded for the resident" framing. The same boundary explains the principled deferral of advice in subdomains where the firm does not feel sure, with P10 handing heat-pump advice off to a specialist partner because the company "does not want to give advice on subjects it is insufficiently sure of".

Government respondents

National government has three angles across the interviews. P03 monitors at RVO via energy-label registrations linked to BAG and Kadaster, supplemented by CBS aggregate consumption, ISDE applications, *Nationaal Programma Lokale Warmtetransitie* (NPLW, National Programme for Local Heat Transition) input, and sector reports. P04 sits at the ministry where EP-Online hosts both the energy label and the BRP added in May 2026, with no separate evidence layer. P11 works at a national executing agency on the energy-performance methodology (NTA 8800) and the VerbeterJeHuis online tool, including the QuickScan plus 3D-*keuzehulp* split and the use of attested software as a trust mechanism. Across the three the data needs converge on the energy label and its component fields. Government respondents are the heaviest namers of `DN-F-LABEL` (37 of 62 mentions across the interviews), `DN-F-AREA` (13 of 26) and `DN-F-INSUL` (35 of 73 across the two government rows), and the only respondents who name `DN-L-LAND` and `DN-L-GEMEENTE` to any meaningful extent. P03 is sharp on the limits of their own data:

> An energy label is all model-determined. There is no actual energy consumption in it. What is in there is theoretical energy consumption based on the NTA, calculated with that NTA.
>
> (P03, paraphrased)

When a label is missing, the agency falls back to extrapolation on construction period, dwelling type, tenure, and usable floor area, with the explicit caution that the spread within each cell is too large to license single-dwelling inferences. P04 and P11 add the upstream causes. The label-based EP-Online dataset captures only the output registration record; the evidence dossier sits with the advisor and is lost when the advisor exits the market; the label is valid for 10 years and lags renovation by years across ownership changes; and there is no invoice standard to capture executed works in a usable form. The BRP on the EPBD timetable inherits the same evidence gap by design.

Municipal respondents (P08, P12) describe their role as facilitating and signposting at the citizen interface; P12 additionally describes municipal heat-plan- and insulation-plan-forming at the policy level. Their actively managed dataset stays shallow at the level of tenure, construction year, dwelling type, and energy label, plus a record of any municipal insulation subsidy taken up. P12 routinely uses the energy label as a proxy for insulation quality, identifying roughly 25,000 insufficiently insulated households in their municipality on this basis, while explicitly putting question marks at their own figure and noting that the reality differs but no better metric is available. Both municipalities operate the municipal heat-plan process at district level, with externally produced cost-reference-based technical maps combined with stakeholder consultation, and the strategic plan then translated into a district implementation plan where the data demand inverts. Aggregated registers are insufficient for individual actionable perspective, and the municipality reverts to door-to-door inventory-taking. P08 frames the data layer as a fragmented whole that varies per actor and per purpose, and a meaningful BRP in their formulation has to connect both granularity levels, with reliable public base data for steering at one end, alongside fine-grained and reliably maintained dwelling data for individual roadmaps at the other.

Citizen initiatives and energy cooperatives

The citizen-initiative grouping (P09 in their foundation role; P16 secretary of a neighbourhood foundation; P17 chair of an energy cooperative) carries a distinctive organisational reading of the data question. All three operate at neighbourhood scale, position themselves expressly as informing rather than advising, and treat the renovation problem as a social question alongside the technical one. The output they aim to provide is a mobilising apparatus, including collective procurement campaigns (P17′s bio-based insulation campaign), neighbourhood-scale energy ambassadors, formal viewpoints on environment visions and municipal heat plans, and resident meetings where student interviews and model-dwelling analyses translate building-level questions into a district-level approach. The data that supports this work draws principally on open and aggregated sources rather than per-dwelling intake, including BAG and 3DBAG (for geometry and orientation), climate data, annual consumption via distribution companies (about 10 years of open data, enough to see the post-2022-price-rise behavioural shift), and EP-Online, supplemented by municipal-archive drawings retrieved by hand and by walking the neighbourhood to see what BAG geometry does and does not capture. P16 makes the strongest version of the EP-Online critique, framing the label database as historically polluted by an earlier cheap self-registration procedure that gave residents an incentive to register a favourable label for sale-value reasons (developed in Section 4.1.2).

P17′s cooperative is similar in role but different in how it works. The *fixbrigade* (fix-team) does small physical measures in housing-corporation property and reports in aggregate to the municipality for subsidy accountability. The energy coaches work through the Hoomdossier. The cooperative treats the Hoomdossier as a private tool between resident and energy coach and does not aggregate it, even though aggregation would benefit the resident initiatives the cooperative supports. The cooperative also refuses to produce a recommended-supplier list because of `X-LIABILITY` exposure, since the same supplier can perform well in one case and not in another with a different installer. Two underlying resident initiatives nonetheless do collect address-level data on construction year, previously taken measures and energy consumption to size neighbourhood heat-pump or neighbourhood-battery capacity, an explicit per-address granularity choice driven by collective infrastructure planning rather than individual advice. P09′s foundation works as a hybrid: the advisor side runs at fine-grained dwelling level for paid renovation projects, and the foundation side runs at homeowners' association and portfolio level. Both sides return repeatedly to data quality, with the four-question test for drawings as their recurring reference and the observation that seemingly comparable properties in the same series turn out to differ in materials, layering, or hidden asbestos.

Demand-side cases: homeowners and a private landlord

The demand-side accounts (P01, P05) are reported here as case material rather than as evidence about owner-occupiers as a class. P01 is an engineer-pioneer who renovated their own home according to a *Trias Energetica* logic, used an energy advisor for the priority-measures list (acknowledging that the added value of an advisor is greater for a non-technical layperson), priced glass via three local quotes, and installed a heat pump through a workaround (their own son and a friend, via a certified company so the warranty held). Their data is dispersed across hanging folders plus the cloud, and their label has not been updated since the renovation. They generalise the experience to the class, namely that energy labels lag actual state because the update has to be paid for and there is no transaction trigger.

P05 is an architect, private landlord, and owner-occupier; the case shows the same data working as different artefacts in different roles. For the rental portfolio, label and points-system documentation are formally maintained in the cloud as a fiscal and legal safeguard (rental-income taxation, points-system challenges by a tenant), and the energy label is decisive for liberal-zone classification, with solar panels on roofs allocated per-unit specifically to clear the threshold. For their own home, by contrast, the heat-pump receipt sits in the kitchen drawer and the label will only be updated at sale. The same *Wet waardering onroerende zaken* (WOZ, property-valuation register) value gives them an incentive to formalise renovations on the rental side and a disincentive on the owner-occupier side. They raise liability concerns specific to a landlord (registered floor-area discrepancies after interior insulation, prior-tenant data, fire-safety dates) that go beyond the data classes professionally focused respondents discuss.

4.1.2. Theme 2: Current data sources, and their reliability

The data sources named across the interviews fall into four categories. The institutional layer is carried by BAG and 3DBAG (anchored on the Kadaster) and by EP-Online with the underlying energy-label registration. The historical layer sits in the municipal archive together with the building drawings firms keep in-house. The fourth category is what the resident plus on-site inspection adds in the room. Reliability concerns are widespread across all four. `DN-QUALITY` is the seventh-most-frequent code across the interviews (n=79), and where it fires it almost always fires on a specific source. The four named-source codes (`DN-S-BAG` n=15, `DN-S-LABEL` n=19, `DN-S-KADASTER` n=7, `DN-S-DRAWINGS` n=13) are heavily concentrated at government level for `DN-S-LABEL` (16 of 19 mentions are RVO-level) and at contractor level for `DN-S-DRAWINGS` (6 of 13 are at contractor level), which is consistent with the picture in Theme 1.

BAG, 3DBAG, and the Kadaster as the registry layer

BAG is the entry point for the advisor and OSS practice. P02 keys their organisation's intake on postcode plus house number, picks up the construction year from BAG, and combines it with Google Maps for a first visual reading of the facade and the roof orientation. The construction year is reliable enough in practice that P02 treats it as the only external dataset routinely used; the insulation norms in force at that date are then assumed to apply because contractors historically applied the legal minimum. At government level, P03 uses BAG via the *verblijfsobject* identifier as the spatial identifier that links labels and Kadaster data, and rates the digitisation and standardisation of CBS and Kadaster data as good. The 3DBAG enters at the citizen-initiative end (P16: typology, orientation) and at the national-tool end (P11: the 3D-*keuzehulp* on VerbeterJeHuis is fed by BAG, Kadaster, CBS, the *Actueel Hoogtebestand Nederland* (national elevation dataset), and point clouds). The Kadaster is named relatively rarely (`DN-S-KADASTER` n=7, five at national-government level), consistent with its role as an upstream registry rather than something advisors and contractors actually pull from. Its two functional uses in the interviews are as a tab on *MijnOverheid* alongside the energy label (P04), and as the formal route for resolving discrepancies in government sources (P16).

The reliability gap that respondents name on BAG is mostly at the dwelling-detail level rather than the base register. P03 notes that the *verblijfsobject* identifier does not record the position of an apartment in the building (top floor, corner unit, mid-position), even though that position is decisive for heat loss. P16 walks the neighbourhood and finds that not every extension, conservatory, or dormer is captured in BAG, and that BAG and EP-Online disagree on surface area for the same dwelling without a formal procedure to resolve it. P14 (the second contractor in the P13-P15 group) describes a parallel gap from their earlier work in the solar-panel market, namely that a point cloud of the roof by a specialist supplier yielded a structurally different number of panels per roof from the figure derived from architectural drawings.

EP-Online and the energy label

EP-Online is the most-used and most-criticised source across the interviews. The label feeds the QuickScan and 3D-*keuzehulp* on VerbeterJeHuis (P11), the *maatwerkadvies* that underlies the BRP (P04), the monitoring at RVO (P03), and the municipal insulation plans (P12). Where it is available at advisor or OSS level it is used opportunistically for glass type, surface areas of building components, and the existing insulation status (P02, P09). Two structural reliability problems are named consistently across the interviews, plus a third that is specific to data scope.

The first concerns historic data quality. The certified label is roughly two to three years old (P02), and the pre-2023 self-filled labels are widely treated as unreliable. P16 makes the strongest version of the point:

> The label database is, in their view, historically polluted. There have been periods in which residents could register a label via a cheap application procedure that did not match the actual situation, partly because a favourable label affects the sale value of a dwelling.
>
> (P16, paraphrased)

P12 is similarly direct that the energy label does not give a reliable picture of the actual insulation status of a dwelling. The contractor group (P13-P15) reports redundant intake by multiple parties on the same housing stock with mutually divergent results. P03′s monitoring practice circumvents the problem by treating the label as a model output ("an energy label is all model-determined") and by extrapolating across dwellings in the same vintage-type-tenure-area cell rather than inferring a single dwelling.

The second concerns the update lag. P04 notes that the energy label is valid for 10 years, so an owner who renovates does not refresh it; the next owner inherits the outdated label, and after two transfers the trail has been lost. P01 generalises this with the observation that there is no transaction trigger and no economic incentive to update. P05 makes the same observation from both sides of the WOZ rule, with the formal landlord-side incentive contrasting against the owner-occupier disincentive.

The third concerns the data scope of EP-Online itself. P04 distinguishes the full evidence dossier (photographs, quality declarations, R_c-values, surface areas per building component) that the advisor retains from the limited part of output data that is uploaded to EP-Online. The component surface areas that an advisor captures during the survey do not enter the registration record; the evidence dossier is lost when the advisor stops, fails or retires. P03 confirms the same scope from the other side, in that they miss the component surface areas for dwellings without a label, and use the EP-Online registrations primarily for the EP2 value rather than for component-level U-values, even though the latter are technically present.

Municipal archive and building drawings

The municipal archive and the building drawings stored by the firm itself are the contractor's main historical source. P10 retrieves drawings for almost every project but reports that the expanded permit-free building rules leave gaps in the history of work done by neighbours, which can produce structural uncertainties that cannot be derived from the dwelling itself. P09 sets out the four-question reliability test (available, digitised, actualised, corresponding to the current state) and reports systematic divergence between the drawing and the actual execution.

P10′s 20-year-old fax with glazing data illustrates the practical value of the firm-internal paper archive even decades later. P13-P15 add a parallel illustration of the limited reliability of this layer with a wood-rot-in-window-frames example where the window frames had been drawn as healthy, and a housing-corporation-side observation that even recent BIM as-built models are not actively used: the corporation migrates the core data to Excel and the rest of the digital as-built effectively disappears.

Resident self-report and on-site inspection

When the institutional layer is silent, advisors, OSS, energy coaches, contractors, and citizen initiatives fall back on the resident and on direct inspection. P02′s intake is built on this principle, with everything beyond the construction year asked of the resident, and the practical tips they give residents to self-check (the crawl-space hatch for the floor, drilled holes for the cavity wall, the rebate or lighter test for the glass) are typical of the OSS register. P09 supplements this with an on-site survey when drawings are insufficient. P10 measures surfaces themselves for orders and subsidy estimates, and inspects the dwelling in person before quoting. The recurring caution across this group is that the resident often does not know basic fields. P16:

> Residents often do not know the R_c-value of their walls or the type of insulation, and that ignorance is a fundamental data problem.
>
> (P16, paraphrased)

The on-site inspection is treated as ground truth where the institutional data is absent or contested, but it carries its own constraints. Occupied dwellings cannot be opened destructively in the pre-phase (P10, P11), and even where a single dwelling can be opened destructively the rest of a complex still diverges (P09).

4.1.3. Theme 3: Data sharing, storage, and handover between stakeholders

The picture that emerges across the interviews is that each professional stakeholder runs an internal dataset of its own, and these datasets do not, in current practice, exchange information meaningfully. The *energieloket* platform of P02 is keyed on postcode and house number and stores which measures have been advised and which have already been carried out; the reporting to municipalities is aggregated, and the raw household-level data is explicitly held back, both because the data carries a commercial value and because the residents have not given explicit consent for sharing with the municipality. The volunteer energy coach (P06) works in the Hoomdossier; P17 reports that the cooperative they chair deliberately treats the Hoomdossier as a private tool between resident and energy coach, not aggregated. The contractor's central digital system (P10) and the corporation-facing Enterprise Resource Planning (ERP) system at P13-P15 contain rich data on day-to-day work that does not exit to advisors or to municipalities. The advisor (P07, P09) keeps data digitally but in practical work formats (Excel, project folders, SharePoint, rented virtual server space). National government (P03, P04) holds EP-Online and the registration data, but only the output registration record, not the underlying evidence dossier.

Three exchange patterns are nonetheless visible in the data, none of them at the level of a shared dataset.

The first is resident-mediated handover. The resident carries documents, quality declarations, and energy bills from one party to the next. P05′s son acts as the analytical hub for the rental portfolio's label and points-system calculations; P01 forwards installer-provided photographs to RVO via the ISDE application the installer prepares; P10 supplies photographs, codes, surface areas, and a declaration to the resident so the resident can submit the ISDE itself, since the installer cannot file the application without a personal digital identity. The reliability of this channel depends entirely on the resident's diligence; P01′s "I just don't have my technical information in order" is the central observation here.

The second is referral. The OSS (P02) presents a neutral list of companies on its website with visible certifications, without a preferred order, and refuses to recommend a specific party. The cooperative (P17) goes further and refuses on liability grounds to compile the recommended-supplier list that the municipality has asked for. The contractor (P10) refers heat-pump cases to a specialist partner. In all three cases data does not change hands; only a pointer to the next party is shared.

The third is aggregated reporting. The OSS (P02) sends reports to municipalities on how many residents have been contacted, how many measures advised, how many already executed. The cooperative's *fixbrigade* (P17) reports in aggregate for accountability over the municipal subsidy, deliberately excluding address-level detail. P06 retains thermographic images as a separate report that does not flow into the Hoomdossier and is explicitly deleted after use, because the privacy classification differs.

Two structural rules govern what crosses an organisational boundary. The first is liability-driven and, across the interviews, most clearly named as the AFM-permit boundary on financial advice (P02): an organisation without that licence informs but does not advise on financing. The second is privacy-driven and, across the interviews, most clearly named in the household-level energy-consumption discussion. P03 enforces it for CBS aggregate consumption (allowed at averages, not at building level). P02 reports a willingness to share data via a central system, on condition that government imposes it on all parties equally and with a clear quid pro quo, and prefers an Application Programming Interface (API) connection on top of the existing system over a new silo. P17 reports member-level data in Econobis and treats the cooperative-municipality boundary as aggregated by design. P06 explicitly notes the inverse risk: residents tend to leave energy coaches as authorised users on their Hoomdossier indefinitely, which they frame as a privacy risk that the residents themselves do not see.

The friction this fragmentation produces is most clearly named at three points in the interviews. P02 calls out the granularity mismatch: the OSS works in a hierarchy of main category, sub-category, and measure (roof insulation comprises sloped roof from inside, sloped roof from outside, flat roof from inside, flat roof from outside), and a municipal request at the level of "is roof insulation present?" does not line up with what the OSS actually records. P04 names the absence of an invoice standard. P07 names the interoperability gap between the software packages in their own field, "they talk poorly to each other", with the same base information translated repeatedly across phases for heat-loss calculations, hydraulic models, execution preparation, and business cases. P13-P15 add the within-firm version, in which a fragmented set of applications (cloud-based ERP, SharePoint, plus specialised tools such as a BCI tool for the environmental-cost indicator) sits side by side with no link to the ERP. The complaints share a common form, namely repeated translation of essentially the same data across boundaries that need not exist.

4.1.4. Theme 4: Reactions to the data-model artefact as a hypothetical Dutch BRP

The reactions cluster around six expectations and concerns, ordered by code frequency and per-stakeholder distribution.

Integration over replacement, and trust as data reduction

The most frequently coded BRP-related expectation is that a Dutch BRP integrates with existing systems rather than replacing them (`BRP-INTEGRATE` n=77, second only to `BRP-COMPLETE` n=76 among BRP codes). Each professional stakeholder already runs an internal dataset of its own (Section 4.1.3). The realistic ask, in P02's formulation, is an API connection on top of the existing system, plus national uniformity of minimum requirements so that an organisation does not have to build to municipality-by-municipality specification. P04 echoes this from the policy side, in that every software vendor currently works with its own data model, and the data-storage layer is overlooked in current architectural discussions, which prevents an energy label written by one certificate-holder from being continued in another's package. P09 adds the requirement that any digitalisation presupposes machine-readable digital drawings rather than scanned PDFs if the source layer is to feed downstream tools. P13-P15 prefer source-of-truth updating with an API or AI-driven translation layer over a new central layer stacked on top of the existing tooling, on the practical concern of how a separate central layer would be kept current. P16 makes the same point with the warning that, without a clear organising principle, the model risks becoming "an extra layer in an already fragmented field".

The closely related expectation is that the value of a central source comes chiefly from reducing repeated data collection and destructive research (`BRP-TRUST` n=60). This is stated most clearly by the contractor group. P10 frames it as the principle that information does not have to be requested and shared all over again, and ties it directly to a record-once-reuse-later expectation that is welcomed across roles (P01, P10, P13-P15). P13-P15 see particular value at block level, where multiple parties can work from the same information and resident-facing scenarios can be made comparable. P01 reframes the BRP mid-interview from a register of facts into something more active:

> Only in this conversation do I realise that such a database is necessary information to make planning and monitoring possible. The value of the database lies in much more than facts alone. It is fuel for new sustainability investments, which gets an acceleration and a flywheel going in the Netherlands.
>
> (P01, paraphrased)

Their earlier description of what they would want from such a system, given as a layperson-fillable format with behavioural components producing an automatic roadmap that they could discuss "at the kitchen table", is consistent with the same trust-as-data-reduction logic.

Privacy at the transition to a public central system

Privacy concerns arise specifically at the transition to a public central system, not in current professional-resident contact (`BRP-PRIVACY` n=58; `BRP-COMM` n=11). In day-to-day work, residents readily share setpoints, household composition, and consumption with a trusted individual professional. When the same data is asked for a central government-facing platform, the tone shifts. P01 proposes a tiered model in which commercial offer levels may be published anonymised and behavioural data stays with the owner:

> I would find it very useful for society if this came fully available in anonymised form. Including the price levels of the various quotes you request.
>
> (P01, paraphrased)

P02 explicitly declines to pass raw household-level data to municipalities without resident consent, preferring aggregated reports. P05 raises a pair of landlord-specific concerns, namely that detailed building data could be used by a tenant in a dispute or by a buyer in negotiation, and that even owner-controlled data leaks into disputes in unpredictable ways (a registered floor-area discrepancy after interior insulation). P06 names the parallel adoption risk that detailed data is interesting "for burglars" as well as for well-meaning people. P07 ties acceptance to the kind of party that holds the data, expecting markedly less willingness from residents to share with commercial energy suppliers than with cooperative or publicly guaranteed parties. P16 keeps survey data on a secured, non-Dutch cloud and explicitly does not share it with the municipality without a clear legal basis. P09 states a two-level rule: clients own the produced documents and reports, and while building lessons can be shared, individual consumption data cannot.

The net effect is that privacy in this material is a design problem about layers and consent, not a blanket barrier. The recurring proposal across the interviews is aggregation at block, street or neighbourhood level (P13-P15, P16, P17) as the workable compromise between information value and privacy.

Advisor impartiality, liability, and the trust boundary

Advisors and OSS staff position themselves as informers rather than recommenders, avoid recommending brands or parties, and guard the boundary against commercial interests. P02 describes overruling a municipality's grid-congestion preference in favour of the resident's interest. P10 defers heat-pump advice to a specialist firm. P17's cooperative refuses the municipality's requested supplier list on liability grounds, though P17 also notes that the cooperative's energy coaches drift toward advising in practice despite the institutional information-only stance. P02 adds a borderline case where the inform-versus-advise split is relaxed (the *mantavloer* example), where the construction condition and historical context materially change the correct measure. P07 is the most explicit on the trust mechanism:

> It always comes down to trust, to being heard, and to taking the other aspects along as well. Even when the calculation is sound, residents still need to feel that the advisor speaks the truth, takes their interests seriously, and tells an understandable story.
>
> (P07, paraphrased)

A BRP that asks advisors to both produce and consume its data has to preserve that boundary. Where it blurs, trust degrades quickly: P12 reports a certified EP-*adviseur* whose calculation was demonstrably wrong, which they tie to a one-day course requirement, while P04 ties the same advisor-side data-quality concern to the absence of an invoice standard for executed works.

Liability and accountability sit alongside trust as a separable design constraint (`X-LIABILITY` n=21). Three different exposures recur. The first is the AFM-permit boundary on financial advice (P02). The second is insurance-driven contractor documentation that shapes what is recorded more than the resident's information demand (P10, who anticipates that this will only intensify). The third is performance accountability that follows from explicit performance agreements or guarantees. P09 ties the granular inputs (airtightness, installation values, glass area, layer build-up of building components) directly to the ability to underpin guarantees. P05 raises the parallel landlord-side exposure on registered floor area, prior tenants, and fire-safety documentation. P17 ties the cooperative's no-recommendation policy back to the same layer because the same supplier or product can perform well in one case and not in another with a different installer. Across the interviews, X-LIABILITY is treated as functionally distinct from BRP-TRUST, in that trust is about credibility while liability is about who pays when something goes wrong.

Standardisation, granularity, and executability

Standardisation and granularity are the most concrete practical blockers (BRP-STANDARD n=46; DN-GRANULARITY n=59, promoted from inductive to deductive code on this evidence). A recurring plea is for uniform minimum requirements at national level (P02, P03, P04). A recurring frustration is that municipalities define commissions differently per contract, which makes scalable service provision impossible, and P02 names this as the largest single inefficiency in their *energieloket* practice. The granularity mismatch was named directly at three different points across the interviews. P02 contrasts a main-, sub- and measure-level hierarchy with the municipality's binary "is roof insulation present?". P12 contrasts the policy-level energy label as proxy for insulation with the per-dwelling detail their insulation plan would actually need. P08 splits aggregated data for steering from per-dwelling detail for a roadmap. Across the rest of the interviews, explicit level-naming concentrates on DN-F-INSUL, DN-F-DWELLTYPE, and DN-F-WARMTEPLAN, while most other fields are discussed at the per-dwelling default without the level being named at all, which sharpens the same point: the fields where granularity tension is named explicitly are the same fields the BRP design has to negotiate across users. The implication for any concrete BRP design is that the levels-of-detail question is not a technical preference but a coordination requirement, in that the same field has to admit different levels for different users.

The granularity question carries a second dimension that P11 names most pointedly, namely executability. The energy-performance methodology was never built to test whether a recommended measure can actually be carried out, and a BRP scaled to the full housing stock without an executability check risks creating a market for "(proverbial) cowboys" whose failures could undermine public support for the sustainability transition. The point is reinforced from the contractor side, where much of the estimation in the pre-phase is "pure experience" (P10), and from the policy side by the absence of an invoice standard (P04). P11′s glass-replacement example sharpens it further, in that the state of the window frame, the load-bearing capacity for triple glazing, and the logistic delivery question sit outside the energy calculation but determine whether the measure can be executed at all. The implication is that any concrete BRP design has to decide explicitly whether it claims to cover executability or stops at the energetic advice; mixing the two without that decision generates the data-determinism risk that P11 names.

Adoption, cost, and the question of who pays

Adoption across the interviews is framed as a 5-10% versus 90% problem (BRP-ADOPT n=54). P01 places themselves in the first segment, estimating that they are among the 5-10% who want and can afford this, and adds that the system only really works once 90% see the point of it. P10 reports that 80-90% of private-market clients still choose a gas boiler, implying a heat-pump adoption of 10-20%, and names initial cost and unfamiliarity as the determining factors, with TV renovation shows shaping client expectations. P17 reports a layered curve in their cooperative, where an intrinsically motivated top layer is largely served, demand at the energy coaches is gradually declining, external shocks in the energy-price spike temporarily increase demand, and the middle group moves on social proof, financial return, and dwelling value. A BRP that only serves the first segment risks reproducing the current imbalance.

The cost of the BRP itself sits alongside adoption as a live question (BRP-COSTBRP n=9; BRP-UPDATE n=27). P01 makes the analogue explicit:

> It is odd that you improve your house and then have to pay to get your next energy label.
> (P01, paraphrased)

P12 adds the contemporary version, where an EP-report costs around 500 euros, and they would rather see a resident invest that in floor insulation than in a paper report. They note that some municipalities subsidise the EP-*adviseur* report precisely to remove the threshold and to obtain the data. P17 names another dimension of the same problem, in that a resident who has had advice from an energy coach and has insulated the floor records that nowhere formally, so the system loses information. The implication is that any concrete BRP design has to name explicitly who pays, what triggers an update, and what counts as a recordable event short of a *maatwerkadviseur* survey.

Actionability and lay-accessibility

A BRP that does not point to a concrete next action is, across the interviews, not what stakeholders are asking for (`BRP-ACTION` n=72; `BRP-ACCESS` n=50). The frame across roles is roadmap-as-output rather than database-as-output. P01 describes a layperson-fillable format with behavioural components producing an automatic roadmap that they could discuss "at the kitchen table". P02′s measure-level advice and P12′s heat-implementation plan are concrete examples of the same logic at OSS and municipal level, and P04 places the ministry's renovation-passport timetable inside the same logic by hosting the passport in EP-Online with the recommendations directly visible to the citizen on *MijnOverheid*. The accessibility dimension shows in P06′s self-framing as a neighbour who happens to know a bit more, where the volunteer energy coach role is built explicitly on translating renovation knowledge into terms a layperson can act on. The implication is that any BRP design has to face two layered requirements at once, namely an underlying data model fit for advisor and contractor work, plus a presentation layer that translates the data into an actionable next step for a layperson with no professional vocabulary.

Reactions to the artefact itself

Two artefact-specific reactions remain after the integration, trust, and accessibility expectations above, plus a separable observation on user-fit. First, 3D geometry is viewed as overkill at the dwelling-advice end of the interviews (P02 at OSS level; P03 at RVO monitoring level explicitly: "a spreadsheet with the same content is sufficient"), but of potential value at block and homeowners' association level by the contractor group and by P09; for P09, 3D drawings already capture environmental factors such as tree rows and opposite buildings affecting solar exposure. P07 sees the value not in 3D as such but in a visual front-end that bridges complex underlying spreadsheets, Geographic Information System (GIS) environments, and calculation tools. Second, behavioural and comfort fields are the most debated scope item, and their inclusion depends on whether the BRP is framed as a building record or as an advisory tool. P04 keeps usage data out of EP-Online; P03 adds that ventilation type is relevant at trend level rather than dwelling level; P16 prefers to keep heating behaviour and resident occupancy outside a building-oriented passport altogether; P01 wants behavioural fields included but visible only to the owner. The editorial question of how the BRP is framed returns in Chapter 5.

A separable artefact-specific finding is that the model fits some user groups more directly than others. P11 sees value for the energetic side and acknowledges cone-penetration soil testing as a possible executability-test technique, but holds firmly to their data-determinism critique:

> Without integration of executability, building-physics risks and the practical reality of the construction supply chain, a substantive difference will remain between what models predict and what can actually be realised on a construction site.
>
> (P11, paraphrased)

P17 sees the strongest direct value not for the cooperative itself but for the resident initiatives the cooperative supports, with a concrete use case in an aquathermia initiative that needs to know which dwellings already carry an individual solution and which need substantial insulation before a low-temperature alternative is realistic.

4.1.5. Theme 5: Inductive themes identified during coding

Two themes recurred across three or more interviews without fitting cleanly under a deductive code, and were promoted into the codebook (see Section 3.5). The field-level inductive codes (`DN-F-*`, `DN-S-*`, `DN-L-*`) are reported alongside Themes 1 and 2 above rather than separately. The contested-data zone around cost, behaviour, and comfort is reported in Section 4.1.1 (where it appears as part of the advisor and OSS data needs) and revisited in Section 4.1.4 (where it becomes a BRP scope decision). The execution gap and the data-determinism critique are reported in Section 4.1.4 under standardisation, granularity, and executability, where they sit most readably as a BRP design concern. The wider intermediary field that the interviews reveal beyond the literature's canonical roles is reported as a cross-grouping observation in Section 4.3.

Social networks and energy ambassadors as a parallel advisory channel

The role of trusted peers, energy ambassadors, and informal social networks is consistently named as a realistic adoption lever beyond the canonical professional channels (`SH-NETWORK` n=6; `X-PIONEER` n=13). The channel is strongest in the homeowner interviews and in the citizen-initiative interviews. P01 describes themselves as a pioneer in their social circle, with friends and direct colleagues adopting measures based on trust in their judgement. P06 reports that residents rarely come to the energy coach alone for information, and that neighbours, friends, children, and parents, plus word of mouth and personal experiences in the immediate environment, often determine which firms, brands, and products eventually receive the order. P07 observes that residents share more in informal settings when the advisor is sitting next to a known intermediary (a homeowners' association board member, a building caretaker). P12 names district approaches in which practical examples from other homeowners and contact with people in a comparable position translate into collective procurement. P16 reports the municipal energy-ambassador model. P17 documents the layered adoption curve with social proof as the key middle-segment lever. The channel is largely absent from the canonical literature reviewed in Chapter 2 but is consistently named as the realistic lever for scaling beyond the early-adopter segment.

Collective and district-level approaches

The collective-and-district-level approach, treated as cross-cutting because it cuts across SQ1 and SQ2, deserves explicit mention here (`X-COLLECTIVE` n=34). P07 frames the shift from individual to collective business cases as the major contemporary direction in their advisory practice. P12′s municipality works at district level for the heat programme. P16 and P17 operate the citizen-initiative and cooperative ends of the same continuum. The contractor group at P13-P15 sees clearer value in shared data at block level than at individual-dwelling level. The collective dimension is a recurring counter-frame to the individual-advice trajectory implied by the BRP literature, and a key source of variation in the level of detail at which respondents want a BRP to operate.

4.2. The renovation-history gap

Across the advisor, OSS, contractor, citizen-initiative, municipal-government, and national-government groupings reported in the previous themes, one cross-cutting data gap recurs (DN-HISTORY n=48; BARRIER-DATA n=49). The gap is not the absence of a single field but the absence of any carried-forward record of building data previously captured for the dwelling. By renovation history is meant the accumulated trail of what earlier professionals have collected and produced about the building, including photos, drawings, on-site surveys, calculated R_c-values and U-values, executed-measure entries with materials and specification, and post-renovation states, alongside the bare fact of which measures were taken. The advisor's project folder, the contractor's pre-quotation site visit, the energy coach's Hoomdossier entry, and the certified label's evidence dossier each contain such material today, and none of it crosses an organisational boundary; each successive professional therefore recollects from scratch what an earlier one has already gathered. Advisors cannot see what was done before, contractors cannot rely on what is recorded, and homeowners do not retain it systematically. Municipalities cannot feed back the sustainability progress into their own analyses (P12), and national government respondents name the lack of a central history platform as a fundamental limit on monitoring (P03, P04). The contractor group (P13-P15) sees data divergence between executed works and the housing corporation's registration, and the cooperative (P17) acknowledges that follow-up surveys to detect actual uptake of advised measures are something they cannot reliably control. P02 names it as the second main inefficiency in their *energieloket* practice, after municipality-by-municipality variation in commission formulation. P04 frames it as the third bottleneck after adoption time and labour capacity, arguing that if what has been done to a building in the past can no longer be retrieved, future renovation advice can no longer be properly substantiated.

Of the data categories named in the interviews, this carried-forward record is the one with the most consistent multi-stakeholder demand and the most consistent absence in current practice, and it returns as the most directly addressable item in Chapter 5.

4.3. Cross-stakeholder information-requirements matrix

Table 12 and Table 13 below summarise the qualitative narrative of the 15 interview summaries against the stakeholder groupings of Section 4.1.1, with cells indicating whether the field or source is a primary, situational, or non-routine input for that grouping in current advice or execution work. The judgements are the reading of the interview summaries, with the coded-excerpt counts from the ATLAS.ti project used as reference during analysis, but they are not the basis for the assignments in the cells.

	Professional				Government		Citizen
Data field	**AD**	**OSS**	**CO**	**CT**	**GN**	**GM**	**CI**
Construction year (vintage)	○	●	●	○	●	●	●
Dwelling type / position in building	●	●	●	○	●	●	●
Surface areas (facade, roof, floor, glazing)	●	●	○	●	○	○	●
Orientation / solar exposure	●	○	○	○	–	–	●
Insulation status, materials, thickness	●	●	●	●	○	●	●
U-values / R_c-values per component	●	–	○	●	○	–	○
Glazing and window frames	●	●	●	●	○	–	○
Heating system	●	●	●	●	●	●	●
Ventilation system	●	○	○	○	○	–	–
Solar panels	○	○	○	○	○	–	○
Energy label	○	○	●	○	●	●	○
Energy consumption (gas, electricity)	●	●	●	–	●	○	●
Warmteplan / *aardgasvrij* district context	○	●	–	–	○	●	●
Monumentstatus / *welstand*	○	○	○	○	–	○	○
Building drawings and as-built records	●	○	○	●	–	○	○
Cost / price information	●	●	○	●	–	○	○
Resident behaviour and occupancy	●	●	●	–	‡	‡	○
Comfort complaints (draught, mould, cold)	●	●	●	○	–	○	○
Carried-forward renovation-history record	●	●	●	●	●	●	●

● primary ○ situational, or only invoked for deeper trajectories – not typically used ‡ deliberately excluded

Table 12: Concrete data needs for current advice or execution work. AD = certified energy advisor; OSS = one-stop shop; CO = volunteer energy coach; CT = contractor / installer; GN = national government; GM = municipal government; CI = citizen initiative or energy cooperative. Own work.

The matrix shows three patterns. First, only one snapshot field is primary for every grouping, namely the heating system, which anchors work from installer specification to municipal heat plan. The final row sits in a different register from the other 18: it is not a snapshot field of the dwelling itself but the renovation-history record introduced in Section 4.2. Read this way the row is primary for every grouping not because each grouping needs the same single fact, but because each grouping would draw on whatever the prior record happens to contain, and today that record cannot be reused across actors. Second, the energetic fields that the EP-Online register prioritises (energy label, U-values, surface areas) are weighted very differently across the field, with government respondents working primarily from the label, the contractor and advisor groups working primarily from drawings, surfaces, and component-level installations, and the volunteer energy coach and citizen-initiative groups operating from a mix of resident self-report and open data. Third, the cells where the picture diverges sharply between groupings (cost, behaviour, comfort, label) are precisely the fields that respondents reported as contested in the BRP-scope discussion of Section 4.1.4. The matrix is therefore not just a description of current practice but also a forward-looking handle on which fields the BRP design has to negotiate.

A separable cross-grouping observation is that the interviews reveal a wider intermediary field than the literature reviewed in Chapter 2 recognises (`SH-INTERMEDIARY` n=51). Beyond the canonical advisors, contractors, OSS, and government, the interviews name a diverse intermediary class:

- knowledge institutes and consultancies: TNO, Vereniging Eigen Huis, Milieu Centraal as an organisation, De Twee Snoeken (with its SmartTwin product), and knowledge institutes co-developing scenario tools with citizen initiatives;

- additional national-government actors: NPLW and RVO-internal teams beyond the EP-Online cluster;
- citizen-side organisations: citizen-initiative foundations, energy cooperatives, and umbrella organisations;
- municipal executive and advisory bodies: municipal executive organisations under the *Gebiedsgerichte Bestrijding van Energiearmoede* (GBEA, area-based energy-poverty programme), and external advisory firms producing cost-reference-based technical maps for heat programmes; and
- other actors: banks giving free building-specific energy advice to mortgage clients (P04), and water boards as owners of potential heat sources.

None of these are advisors or contractors in the literature sense, but each shapes how data is captured and how advice is given in measurable ways, and the matrix above accordingly underrepresents the data flows these intermediaries carry. Table 13, below, complements the field picture by reporting where each grouping actually draws its inputs from.

	Professional				Government		Citizen
Data source	**AD**	**OSS**	**CO**	**CT**	**GN**	**GM**	**CI**
Nationally-available data and tools							
BAG	○	●	○	–	●	●	●
3DBAG	○	–	–	–	○	–	○
EP-Online / energy-label register	○	○	●	○	●	●	○
Kadaster	○	–	–	○	●	○	○
Aggregate energy data (CBS)	–	–	–	–	●	○	●
Google Maps / satellite imagery	–	●	○	–	–	–	–
Cost reference tables (RVO, Casa Data)	○	●	–	–	●	○	–
Subsidy register (RVO specific-purpose grants)	○	●	○	○	●	●	○
Municipal heat plan / heat-transition vision	○	●	–	–	○	●	●
Reference dwellings / tabular defaults	○	●	●	○	●	○	●
Certified EP / NTA 8800 software	○	–	–	–	●	–	–
Individual-building data							
Building drawings (municipal archive)	●	–	○	●	–	○	●
Resident self-report (self-collected)	●	●	●	●	–	●	●
Resident self-report (used from others)	○	–	–	○	○	○	○
Hoomdossier (*Coöperatie Hoom*)	–	–	●	–	–	–	–
Resident-supplied energy bills	●	●	●	–	‡	–	○
Work invoices and quality declarations	–	●	○	●	○	●	–
On-site visual inspection (self-collected)	●	●	●	●	–	●	●
On-site visual inspection (used from others)	○	○	–	○	○	○	–
Thermal-camera survey (self-collected)	●	–	●	–	–	–	–
Thermal-camera survey (used from others)	–	–	–	–	–	–	–
Destructive sampling (self-collected)	○	–	○	○	–	–	–
Destructive sampling (used from others)	○	–	–	○	–	–	–

● primary ○ situational, or only invoked for deeper trajectories – not typically used ‡ deliberately excluded

Table 13: Data sources stakeholders use in current advice or execution work. The table is split into nationally-available data or tools (top) and individual-building data (bottom). Column abbreviations as in Table 12. Own work.

A second feature of Table 13 is what it does not contain. Across the 11 nationally-available tools and the 12 individual-building source rows there is no source that carries the renovation-history record across actors, because no respondent described one. The subsidy register at RVO records only measures that received ISDE or SPUK funding (P03, P04), which is a partial view by construction, since unsubsidised renovations are invisible. EP-Online holds the substantiation behind the most recent label snapshot, which can be up to 10 years old at the moment of consultation and is not updated by subsequent works (P04, P11). The full evidence dossier behind a label is kept privately by the energy advisor and is lost when that advisor retires or goes bankrupt (P04). Reference dwellings and tabular defaults condition on building period and dwelling type and are by definition silent on what has actually been observed or done on a specific dwelling. The matrix therefore makes visible at the source level the same gap that Table 12 reported on the last row.

A separate observation is that one row in Table 13 is entirely empty, and that emptiness is itself a finding. No respondent describes consuming a third party's thermal-camera survey: where thermal imagery features in current practice at all (at the advisor and energy-coach end), the respondent or their partner organisation collects it themselves, and there is no actual route by which one party's thermal photos feed another party's advice. The result is that the energy coach's thermal-camera run and the advisor's partner-org thermal survey are collected anew every time, even when a neighbouring dwelling in the same complex was thermally surveyed the year before.

5. Discussion and Conclusion

5.1. Discussion

This discussion reads the BRP as two things at once: a stepwise roadmap towards a zero-emission building, and a dossier of building data sitting underneath that roadmap (a narrow, renovation-oriented DBL).

5.1.1. The BRP as a roadmap and as a dossier

The EPBD-IV (Section 2.1.2) distinguishes the BRP from the DBL it draws on. The BRP is a building-specific stepwise renovation roadmap; the DBL is the repository of relevant building data on which that roadmap is built. The same instrument can carry both, and the adopted definition in Section 2.1.2 has the BRP drawing on and being stored in or accessible via a DBL (EPBD-IV Art. 12(8)).

The Dutch implementation (Section 1.3.1) implements one of these two halves. The *renovatiepaspoort* that becomes available on May 29, 2026 is the existing *maatwerkadvies* with the *renovatiepaspoort* designation, registered in EP-Online, structured around the three *Trias Energetica*-style steps that P11 describes as the basis of the scheme (insulation and ventilation first, sustainable heat next, on-site renewable generation last), with per-step cost and savings indications attached to each. It is the roadmap half. The dossier half is largely deferred to the broader Dutch building-data infrastructure (Section 2.1.3) and is not part of what the BRP itself is being asked to carry. The dossier half here refers to the question of which building data sit underneath the advice and remain available to subsequent professionals across the 15- to 20-year staged renovation horizon the BRP is meant to support.

The interviews consistently identify the dossier half as the half that practitioners want the next iteration of the instrument to grow into. The remainder reads the dossier side first (Section 5.1.2), then the roadmap side and its executability caveat (Section 5.1.3), the cross-cutting practitioner expectations (Section 5.1.4), the findings that qualify the literature (Section 5.1.5), and the role of the MSRD-based artefact (Section 5.1.6).

5.1.2. The dossier side: data quality, granularity, and the renovation-history gap

Three findings carry the dossier-side argument.

The first is data quality. EP-Online and the energy-label registration are used everywhere in the field but trusted almost nowhere. The certified-label regime is itself only two to three years old (P02), so the bulk of the historical stock consists of pre-2023 self-filled labels that P02 reports as unreliable and that P16 frames in the stronger terms of a historically polluted register. The 10-year validity plus the absence of a renovation-driven update trigger means that an owner who renovates does not refresh, and the next owner inherits an outdated label (P04). For example, BAG and EP-Online disagree on surface area for the same dwelling without a formal procedure to resolve the discrepancy (P16). At national-government level the label is treated as a model output rather than a record of measured state (P03). At municipal level the label is used as a proxy for insulation quality with explicit acknowledgement that the proxy is unreliable but no better measure is available (P12). The recurring pattern is that the field works with the label because it has to, while expecting little reliability from it.

The second is granularity. The cross-stakeholder information-requirements matrix in Section 4.3 shows that the same data fields are needed by multiple stakeholders, but at very different levels of detail. The OSS practice (P02) contrasts its main-, sub- and measure-level hierarchy with the municipal request at the level of "is roof insulation present?". The municipal practice in P12 contrasts the policy-level energy label as proxy for insulation against the per-dwelling detail an actual insulation plan needs. The municipal practice in P08 splits aggregated data for steering from per-dwelling detail for a roadmap. The implication is that the dossier layer should hold the same field at multiple resolutions: each user contributes the level of detail they have, and downstream users aggregate as needed.

The third is the renovation-history gap reported in Section 4.2. Across the advisor, OSS, contractor, citizen-initiative, municipal-government, and national-government groupings, the renovation-history record is the one cross-cutting category of building data that is consistently needed and consistently inaccessible across actors (DN-HISTORY n=48, BARRIER-DATA n=49). The gap is in cross-actor accessibility rather than in absolute absence: municipalities hold partial history through their own subsidy registers (P12), contractors hold detailed firm-internal histories that do not flow outward (P10, P13-P15), and the certified label's evidence dossier sits with the issuing advisor, but none of these records cross professional or institutional boundaries. Advisors cannot see what was done or captured before, contractors cannot rely on what is recorded, and homeowners do not retain it systematically. Municipalities cannot feed sustainability progress back into their own analyses (P12), and national-government respondents name the lack of a central history platform as a fundamental limit on monitoring (P04, with the related under-use of detailed label inputs in P03). The contractor group working for housing corporations reports divergence between executed works and the registration (P13-P15), and the cooperative acknowledges that follow-up surveys to detect actual uptake of advised measures are something it cannot reliably control (P17). The single most addressable item in the dossier-side scope of any future BRP is this gap, and its closure does not require a new methodology, only a shared place where the data each professional already captures can live and be picked up by the next. The recommendation that follows is developed in Section 5.3.2.

5.1.3. The roadmap side: the executability caveat

The roadmap side of the Dutch BRP rests on the existing *maatwerkadvies* methodology, which is designed to produce an energy label and a building-specific measure list rather than an executability-tested execution plan.

A national-government respondent (P11) is sharply critical of what they describe as a kind of illusion among people that all data makes all outcomes predictable; for instance, an energy-performance calculation that says a measure should be taken does not guarantee that the measure can be carried out on this specific dwelling. The respondent illustrates with crawl-space height (a measure cannot be physically executed at 20 centimetres regardless of what the model recommends), interior wall insulation (incorrect handling of the vapour-open and vapour-closed foils can leave the insulation wet within six months), and the cavity-before-window-frame sequence (insulating the cavity first and then replacing the window frame can damage the insulation, while the reverse order does not, and the energy calculation does not produce that insight). The same caution comes up on the contractor side, where much of the pre-phase estimation is "pure experience" (P10) because occupied dwellings cannot be opened destructively before quoting, and in P09′s four-question reliability test on whether a drawing is available, digitised, actualised, and corresponds to reality, made from a dual advisor / foundation-director position. The policy-side observation in P04 that there is no invoice standard for executed works shows the same problem from the upstream side, since there is no structured way to reconstruct what was executed even when the works have been done.

The implication for the roadmap-side design is a caveat rather than a recommendation. A BRP that scales without an executability mechanism risks the pattern this thesis cannot address with the present interview data but which a future BRP design has to decide on explicitly: whether the BRP claims executability or stops at energetic advice, and whether the gap is closed inside the BRP or by an adjacent instrument on the construction side.

5.1.4. Cross-cutting practitioner expectations

Three findings cut across the roadmap and dossier sides and bear on both.

Integration over replacement

A frequently expressed expectation about a Dutch BRP is that it integrates with existing systems rather than replacing them. `BRP-INTEGRATE` is the most-frequent BRP-prefixed code across the interviews (n=77), with the caveat that counts are coded excerpts rather than respondents, so the frequency reflects how often the topic is returned to. Each professional stakeholder already runs an internal dataset of its own (Section 4.1.3), spanning the OSS platform keyed on postcode and house number, the Hoomdossier used by the volunteer energy coaches, the contractor's central digital system and corporation-facing ERP, the advisor's project folders, and EP-Online at national level. The realistic ask across these parties, stated most directly by P02 and echoed across the contractor (P13-P15), policy (P04), and citizen-initiative (P16) interviews, is an API connection on top of the existing system plus national uniformity of minimum requirements, not a new central silo. The citizen-initiative warning in P16, that a layer without a clear organising principle risks becoming "an extra layer in an already fragmented field", captures what the field will reject. The integration expectation applies to both sides. On the dossier side, APIs are the realistic channel for reusing the records each party already keeps. On the roadmap side, the *maatwerkadviseur* tool stack already runs against attested software through which the BRP would be delivered.

Trust dynamics and the impartiality boundary

Trust recurs across the interviews as a finding that the dossier and roadmap halves both depend on. The OSS in P02 presents companies on its website by distance, without a preferred order, and refuses to recommend a specific party. The cooperative in P17 declines to compile the recommended-supplier list a municipality has asked for, because the same supplier or product can perform well in one case and not in another with a different installer, and the cooperative does not want to carry that responsibility. The energy advisor in P07 is explicit on the mechanism, that "it always comes down to trust, to being heard, and to taking the other aspects along as well". P07 describes the corresponding data work as phase-dependent across an early phase that runs on drawings, visual inspection, and photographs, and a later phase towards financial close and tender in which the depth of analysis and the willingness to share rise together with the level of commitment between parties. The municipal respondent in P12 distinguishes *informeren* (which municipalities can do) from *adviseren* (which is for paid expert advisors), and notes that residents conflate the two. The AFM-permit boundary on financial advice (P02) places a hard legal constraint around the same impartiality logic. Across the interviews, the parties that hold the resident's trust are deliberate about what they will and will not recommend, and the boundary they draw is, in part, what the trust depends on.

The finding bears on BRP design as a constraint to preserve rather than as a recommendation to act on. A BRP that asks advisors to both produce and consume its data has to leave the impartiality boundaries intact. Where it blurs them, the interviewed parties expect trust to degrade. The thesis reports this as a finding about the practitioner field and does not translate it into a specific recommendation.

A wider intermediary field than the literature recognises

The Dutch stakeholder mapping derived in Section 2.2.3 identifies a set of canonical roles: certified energy advisor, municipality, installer / contractor, social network / energy ambassador, online tool / digital platform, energy / heat supplier, government information agency, one-stop shop, and construction store. The interviews confirm each role but identify a wider intermediary field that the canonical taxonomy does not capture. Beyond the canonical advisors, contractors, OSS, and government, the interviews name a wider intermediary class that the canonical taxonomy does not capture (see the full enumeration in Section 4.3), spanning knowledge institutes and consultancies, additional national-government actors, citizen-side organisations, municipal executive and advisory bodies, banks, and water boards as owners of potential heat sources. None of these are advisors or contractors in the literature sense, but each shapes how data is captured and how advice is given, in ways the canonical taxonomy does not describe. This is a substantive correction to the literature-derived SQ1 stakeholder set and is reflected in the SQ1 answer in Section 5.2.1.

5.1.5. Where the empirical findings qualify the literature

Two findings qualify the literature, one on how it frames privacy and one on how it positions municipalities.

Privacy in the interviews reads as a layered design problem rather than a blanket barrier. Residents share readily with a trusted individual professional; the tone shifts when the same data is asked for a central government-facing platform. The recurring practitioner proposal is aggregation at block, street, or neighbourhood level as the workable compromise (P13-P15, P16, P17), with the demand-side proposal in P01 of a tiered model in which commercial offer levels may be published anonymised and behavioural data stays with the owner. P06 raises a parallel physical-security framing in which detailed building data is also of interest to burglars, a concern that goes beyond data-protection privacy. The recommendation that follows is developed in Section 5.3.6.

The literature's central-coordinating-role framing for municipalities meets a sharper version of the same gap in the interviews. The literature review (Section 2.2.3) already notes that municipalities are reported among the least-consulted information sources, and the interviews extend the point: the day-to-day advisory relationship runs through intermediaries (OSS, volunteer energy coach, contractor, citizen initiative), with the municipality upstream of that relationship and the municipal respondents themselves (P08, P12) describing their work as facilitating and signposting at the citizen interface, with P12 additionally describing municipal heat-plan- and insulation-plan-forming at the policy level. A small adjacent qualification is the appearance of banks in an advisory role through free *maatwerkadvies* to mortgage clients (P04), a stakeholder the literature-derived Dutch stakeholder set in Section 2.2.3 explicitly excluded.

5.1.6. The MSRD-based artefact as elicitation prompt

The MSRD-based data-model proposal developed in the parallel Geomatics MSc thesis (Section 1.9) is used as the closing-block stimulus in every interview (Section 3.4). The reactions reported in Section 4.1.4 are reactions to that stimulus. The present thesis does not endorse, critique, or recommend the MSRD as a data model; the MSRD-validation claim is carried by the Geomatics thesis. The findings in Section 4.1.4 should be read as expectations of and concerns about a hypothetical Dutch BRP that practitioners could engage with through the artefact, rather than as a verdict on the MSRD. The dossier-side requirements developed in this discussion (multi-resolution data and integration over replacement) are upstream of any future data model that would underpin a Dutch BRP. They are offered as practitioner-grounded input, not as a verdict on this particular one.

5.2. Conclusion

This section answers the research questions stated in Section 1.6 in turn, drawing only on findings established in Chapter 4 and interpreted in Section 5.1. The main research question is restated and synthesised at the end.

5.2.1. SQ1: Who advises Dutch owner-occupiers, and what are their roles?

The first sub-question asks who plays a role in providing renovation advice to Dutch owner-occupiers, and what those roles look like in the advisory process. The literature filter in Section 2.2.3 derived a set of canonical roles from Dutch-context studies: certified energy advisor, municipality, installer / contractor, social network / energy ambassador, online tool / digital platform, energy / heat supplier, government information agency, one-stop shop, and construction store. The interviews confirm each of these roles and refine the picture in three ways.

The first refinement is internal. The canonical advisor role splits into two sub-roles that work differently in practice: the certified EP-*adviseur*, who issues the *maatwerkadvies* on which the BRP is built (Section 1.3.1), and the volunteer energy coach who informs at low threshold without committing to a heat-loss calculation. The canonical government role splits into national (the policy ministry BZK together with RVO as the implementing body for EP-Online and the surrounding licensed-advisor regime described in Section 1.3.1) and municipal (municipal heat-plan, signposting), each with different distances from the resident.

The second refinement is the most substantive contribution of this SQ1 answer. The interviews identify a wider intermediary field than the canonical taxonomy describes, enumerated in Section 4.3 and discussed in Section 5.1.4. A BRP design that assumes the canonical taxonomy alone underrepresents the data flows these intermediaries carry, and the stakeholder taxonomy that any future Dutch BRP design works with should widen accordingly.

The third refinement is relational. The day-to-day advisory relationship is between the resident and an intermediary (an OSS, a volunteer energy coach, a contractor, a citizen initiative), with the municipality upstream of that relationship rather than in it. The Dutch literature describes municipalities as carrying a central coordinating role and at the same time reports them among the least-consulted information sources for owner-occupiers (Section 2.2.3); the interviews sharpen the same gap by showing that the municipal respondents (P08, P12) themselves describe their work as facilitating and signposting upstream of the resident relationship rather than as advising in it.

The answer to SQ1 is therefore that Dutch owner-occupiers are advised through a wider and more layered stakeholder field than the canonical literature names, with paid and volunteer advisory sub-roles, a national-municipal government split, a substantial intermediary class that the canonical taxonomy does not capture, and a day-to-day relationship that runs primarily through intermediaries rather than through municipalities.

5.2.2. SQ2: Which building data are required, and at what level of detail?

The second sub-question asks which building data Dutch renovation-advice stakeholders require to provide informed renovation advice, and at what level of detail. The cross-stakeholder information-requirements matrix in Section 4.3 is the synthetic answer at field level; this section reads it.

Only one snapshot field is a primary input for every grouping in the matrix: the current heating system. The matrix carries one further universally primary row that sits in a different register, namely the renovation-history record (defined in Section 4.2 and read into the dossier-side argument in Section 5.1.2), primary for every grouping for the reason set out in Section 4.3. Every other snapshot field is weighted differently across stakeholder groupings. The energetic fields that the EP-Online register prioritises (energy label, U-values, surface areas) are used heavily at national-government level but treated sceptically by the advisor and OSS groupings, which work primarily from drawings, surfaces, and component-level installations, and by the volunteer energy-coach and citizen-initiative groupings, which operate from a mix of resident self-report and open data. The fields where the picture diverges sharply between groupings (cost, behaviour, comfort, energy label) are precisely the fields that respondents reported as contested when shown the artefact in Section 4.1.4.

The matrix shows that the field-level differences are smaller than the granularity-level differences. The same field is needed by multiple stakeholders, but at different levels of detail (dwelling, block, neighbourhood, municipality, national), with no current mechanism to deliver the same field at multiple resolutions. This is the structural feature that organises the per-stakeholder data-needs picture more sharply than field selection does.

The answer to SQ2 is therefore that practitioner data needs converge on one universal snapshot field (heating system) and on one cross-cutting category (the renovation-history record). They diverge sharply on the energetic fields the current Dutch register prioritises, and are structured by granularity rather than by field selection. A separable destructive-versus-non-destructive intake axis shapes contractor practice (P10, P13-P15), while cost, behaviour, and comfort form a contested zone whose treatment depends on how the BRP is framed.

5.2.3. SQ3: What practical expectations, concerns, and missing elements emerge regarding a Dutch BRP?

The third sub-question asks what practical expectations, concerns, and missing elements emerge regarding a Dutch BRP. The closing-block reactions in Section 4.1.4 carry the answer, organised below as expectations, concerns, and missing elements.

Three expectations dominate. The first is that a Dutch BRP integrates with the systems professionals already run rather than replacing them (`BRP-INTEGRATE` n=77, with the practitioner ask developed in Section 5.1.4). The second is the trust-as-data-reduction logic, in which the value of a central reference comes from reducing repeated data collection rather than from adding a new silo (`BRP-TRUST` n=60). The third is that the BRP's output is a usable roadmap to a concrete next action (`BRP-ACTION` n=72), paired with a presentation layer that lay readers can act on (`BRP-ACCESS` n=50).

The dominant concerns cluster around three design questions. Privacy at the transition to a central public layer is a layered design problem rather than a blanket barrier (Section 5.1.5). Advisor impartiality and the trust boundary against commercial interests must be preserved by design, since the BRP asks advisors to both produce and consume its data. Cost and update mechanism remain open practical questions that the current Dutch BRP scope does not resolve, with the energy-label experience as the cautionary analogue. A separable caveat is the executability gap (Section 5.1.3), with a parallel physical-security framing raised by P06.

The dominant missing element is the renovation-history record (`DN-HISTORY` n=48, Section 4.2, Section 5.1.2), which the current Dutch BRP scope does not address. Closely related missing elements are an invoice standard for executed works (P04), a multi-resolution data layer, and a structured route for parties other than the certified *maatwerkadviseur* to contribute building data into the record (Section 5.1.4).

The answer to SQ3 is therefore that practitioners expect a BRP to integrate via API with the systems they already trust, to reduce repeated data collection, and to produce an actionable roadmap. They raise privacy, advisor impartiality, and cost-plus-update as the three design concerns the next iteration must address (with executability as a separable caveat). They identify the renovation history as the single most consistently named missing element of any future Dutch BRP.

5.2.4. Main research question synthesis

The main research question asks what the building-data needs of the stakeholders involved in providing renovation advice to Dutch owner-occupiers towards an emission-free home are, and what practical expectations these stakeholders have of a Dutch BRP.

The answer reads through the analytical distinction this discussion adopted (Section 5.1.1) between the BRP as a roadmap to a zero-emission building and the BRP as a dossier of building data. The current Dutch implementation, built on the *maatwerkadvies*-as-BRP scheme that becomes available on May 29, 2026 (Section 1.3.1), delivers the roadmap half and registers the advice in EP-Online, but the dossier half (the recording of measures once executed, the post-renovation performance, the multi-resolution data layer, and the broader contributor scope) is not part of the scheme. The empirical findings of this thesis, read through the answers to SQ1, SQ2 and SQ3 above, identify the dossier side as the half that has to grow in any subsequent iteration of the Dutch BRP. The building-data needs the practitioners report are dossier-side needs. The practical expectations they raise are dossier-side expectations. The concerns they raise are design constraints the dossier-side build has to design for rather than around. The implications of this synthesis for the next iteration of the Dutch BRP, for the Dutch building-data infrastructure that would support it, and for further research, are developed in Section 5.3.

5.3. Implications and recommendations

The recommendations in this section are addressed primarily to the parties shaping the next iteration of the Dutch BRP, that is, BZK as the policy ministry and RVO as the implementing body, together with the Dutch building-data infrastructure parties (the Kadaster as the operator of the planned LVG build, and the digiGO foundation as the governance party for the DSGO). The framing is not a critique of the launching scheme as such, since the EPBD timetable forced an early build on the existing *maatwerkadvies* (Section 1.3.1), but rather a practitioner-grounded set of additions and design corrections that the synthesis in Section 5.2.4 identifies as needed to bring the next iteration closer to what stakeholders would actually use.

5.3.1. The societal case: capture once, reuse many

The single most consistent message across the interviews is that building data is captured many times in current Dutch practice and reused almost not at all. Each advisor starts from scratch; contractors find drawings unreliable and fall back to on-site experience; successive advisors do not see what previous advisors recorded. Where the same data is collected twice or three times, the second and third pass is paid for again, by the resident or by public money, without producing anything that the next professional can use.

If renovation-relevant building data is captured once, in a place where any subsequent advisor or contractor can reuse it, the destructive-research and repeated-intake cost the contractor group named directly is removed, the lost-dossier risk that follows from the evidence file sitting with an individual advisor is removed, municipalities can feed completed measures back into their own analyses, and the national-government respondents can substantiate forward advice on what has been done.

The argument is not that the BRP should become the central register for all building data, which would conflict with the integration-over-replacement expectation discussed in Section 5.1.4. Rather, it is that the public infrastructure underpinning the BRP should be organised so that each fact about a dwelling, once captured by a professional doing renovation-relevant work, has a place to live where the next professional can find it. The remainder of this chapter sets out the design and policy choices that would deliver this.

5.3.2. Recommendation: close the renovation-history gap

The renovation-history gap is the single most addressable item in current BRP scope (Section 5.1.2). Its closure has three components: a data model that can hold this record, an obligation to record into it, and a route through which the recording is paid for. Three mechanisms emerge from the findings, each with its own trade-off; the thesis names the options rather than picking one, since the choice is a policy-design decision the next iteration has to make explicitly.

The data-model component is common to all three mechanisms. The government provides a structured data model against the BAG-*verblijfsobject* anchor that the registry layer already uses. The model expresses this record as two complementary layers. The first is a structured measure layer: per recorded measure, the model holds the building-component or installation affected, the materials and specification applied, the date and the executing party, together with the post-renovation performance once a measure has been carried out. The second is the surrounding evidence-and-asset layer, in which the calculated values, drawings, photographs, and on-site surveys that each executing party or earlier professional already produces sit attached to the dwelling, so that the next professional can pick up where the previous one stopped rather than recollecting from scratch. This closes the gap that P04 names in EP-Online, where the input registration and the resulting label are stored but the underlying evidence file is not, and which P03 notes from the monitoring side as an under-use of detailed label inputs.

The recording route is where the three mechanisms diverge. They differ in whether recording is mandated, who pays for the capture, and which part of the housing stock the recording actually reaches.

The first is a subsidy-driven recording without a mandate. The data capture is one of the conditions tied to the subsidy that the homeowner receives for the measure, so that the subsidy administration and the data-capture step are the same act. The trade-off is the same one the energy-label experience already shows: parties who do not draw on the subsidy do not record, leaving the same gap that exists today.

The second is a mandate with publicly funded capture. The data-capture step itself is paid for by the government, modelled on the existing municipal subsidies for the EP-*adviseur* report that some Dutch municipalities already operate (P12). In practice this means a successor service in which a homeowner who carries out a recorded measure receives, at no cost to them, the data-capture and recording into the BRP dossier as a free public service. The trade-off is fiscal: the cost falls on the public purse rather than on the parties whose execution is being recorded. Politically, this route is more likely to be accepted if it is presented as the Dutch implementation of the EPBD recording obligations, rather than as a domestic spending decision in its own right.

The third is a mandate tied to existing administrative obligations. Recording of executed works is made mandatory on completion of any work for which a permit, subsidy, mandatory insurance or guarantee already exists. The mandate piggybacks on the administrative obligations the executing party already discharges (P10 names insurance, liability, subsidy, and anticipated future regulation as the drivers that already shape what contractors record), avoiding a wholly new compliance regime. The cost falls on the executing party. The trade-off is that the recording quality depends on the executing party's incentives.

Each mechanism closes the renovation-history gap differently and creates a different incentive structure. The three can also be read in sequence rather than as alternatives. The subsidy-conditional route is the politically lightest place to start. The publicly funded capture route is the natural next step. The mandate on completion is the end point, reachable once political support has caught up. The thesis recommends that the next iteration of the Dutch BRP take a position on which of these mechanisms it adopts, rather than launch a scheme without any recording mechanism attached.

5.3.3. Recommendation: open BRP contribution beyond the certified *maatwerkadviseur*

The current Dutch BRP, as built on the *maatwerkadvies*, is authored by a single certified *maatwerkadviseur* (Section 1.3.1). The interviews in Section 5.1.4 show that the building data which would substantiate a BRP is in practice generated by a much wider set of practitioners (contractors, OSS, volunteer energy coaches, citizen initiatives, intermediaries), and that most of what they capture never reaches a *maatwerkadviseur* record. A widening of the authorship scope is needed for the renovation-history recording in Section 5.3.2 to work in practice.

The recommendation is that BRP contribution is opened to a wider practitioner class, with contributor-type metadata that travels with each record so that downstream users can interpret the provenance of the data they are working with. The certified *maatwerkadviseur* continues to issue the BRP label that the EPBD requires; alongside that, licensed contractors recording an executed measure, OSS staff recording an advised measure, and recognised energy coaches recording resident-shared data, are allowed to contribute structured records tagged with their contributor type. The advisor-impartiality boundaries discussed in Section 5.1.4 are preserved by design, in that opening the contribution scope does not blur the role boundaries that the interviewed parties themselves rely on for liability and credibility; rather, it widens the channel through which the data each role already collects can flow into a shared dossier.

This widening raises a quality concern on the government side, since records would now arrive from parties who are not subject to the *maatwerkadviseur* certification. One open design route is to attach the contributor type to each record itself. The dossier would then accept records from any of these contributor classes, and each downstream use would decide for itself how much weight to give a record based on who produced it. This is one possibility among several; the broader point is that under any such opening, trust shifts from certification at the source to provenance attached to each record.

5.3.4. Recommendation: design the dossier for multiple granularities of the same field

The granularity-mismatch finding in Section 5.1.2 shows that the same field is needed by different stakeholders at different levels of detail. The recommendation is that the BRP dossier is designed from the outset to admit different views of the same underlying record by role and by level of detail. The aggregation operations between levels should be defined as part of the data model rather than being computed informally by each downstream user. A single record on insulation status carries enough underlying detail (per building component, per material, per R_c-value where measured) to allow per-dwelling reads for advisor and contractor work. The same record also supports aggregated reads at block, neighbourhood, district, and municipal level for monitoring and policy work.

5.3.5. Recommendation: design for integration over replacement

The integration-over-replacement expectation in Section 5.1.4 translates into two design principles for the dossier layer. The first is that the dossier layer exposes APIs through which the systems professionals already run can both write to and read from the dossier, rather than asking those systems to migrate. The second is national uniformity of the minimum requirements that the dossier layer and the surrounding scheme impose, since the P02 observation that variation in commission formulation between municipalities is the largest single inefficiency in OSS practice generalises to any new layer that the scheme imposes on professionals working across municipalities.

5.3.6. Recommendation: design privacy as a layered design problem

The privacy findings in Section 5.1.5 point away from a blanket refusal and toward a layered design discipline. The dossier layer is built with privacy defaults that distinguish three layers. The factual-building-data layer is, in principle, public-record material that can be made available at per-dwelling granularity to authorised professional users and at aggregated granularity to the public. The offer-and-pricing layer is owner-controlled, with anonymised aggregation as a strong default in which prices and offer levels can flow into societal statistics without the resident or supplier being identifiable. The behavioural-and-comfort layer stays with the resident by default, with explicit, time-limited, and purpose-bound sharing to a named professional for the duration of an advisory engagement. The aggregation defaults at block, street or neighbourhood level recur across the interviews as the workable compromise; the recommendation is that these aggregation layers are first-class design objects in the dossier (per Section 5.3.4), not informal post-processing operations.

5.3.7. The LVG and the DSGO as institutional anchors

The recommendations above presuppose a public-infrastructure layer in which they can be built. The LVG (Section 2.1.3) is the Dutch building-data service that the recommendations on the dossier-availability side would sit in; its planned MVP does not yet include the renovation-history layer that Section 5.3.2 calls for, but its federated principle and its registry-layer anchor against BAG are the design moves that the recommendations build on. The LVG in turn sits inside the wider *Federatief Datastelsel* and inherits its governing principle *decentraal wat kan, centraal wat moet* (Section 2.1.3). The DSGO is the construction-sector data-sharing framework, governed by the digiGO foundation, into which the executed-works recording of Section 5.3.2 naturally connects. The LVG scoping study positions the LVG as a supplier of building data into the DSGO rather than as part of it; as a synthesis going beyond what the scoping study itself establishes, the dossier layer described in the recommendations above is proposed here as the layer at which the LVG supply and the DSGO consumption could meet, with the BRP as the practitioner-facing artefact that would draw on both.

5.3.8. Outlook: added value and essentials for further development

Based on the published basis available at the time of writing, the launching scheme implements the roadmap half of what the EPBD calls a BRP. The *maatwerkadvies* with the *renovatiepaspoort* designation, registered in EP-Online and structured around the three staged steps, becomes available on May 29, 2026; the dossier features that the practitioner findings of this thesis identify are not described in the published basis. Whether the instrument grows into one that delivers added value across the staged renovation horizon depends on whether subsequent iterations are built around a dwelling-level dossier. That dossier accumulates all renovation-relevant building data over time, keeps it current, and exposes it through one federated route keyed to the BAG-*verblijfsobject*, with each fact physically sitting in whichever system already holds it.

The essentials for that further development are the recommendations developed earlier in this section, none of which is dispensable under this framing. The capture of executed works, the widening of contributor scope beyond the certified *maatwerkadviseur*, the federated access through APIs to the systems professionals already run, the multi-resolution data layer, and the layered privacy defaults are working parts of the same core argument. The currentness mechanism is essential to that claim and remains the design question the launching scheme does not resolve. Without these, the scheme risks ending up as what the citizen-initiative respondent in P16 described as "an extra layer in an already fragmented field".

5.3.9. Recommendations for further research

Three further-research items follow from the interview findings of this thesis and from the limits the limitations section (Section 5.4) reports on the present sample.

The first is an owner-occupier-side replication study. The two demand-side respondents in this sample are atypical and are reported as case material rather than as evidence about the owner-occupier class. The practitioner-grounded recommendations in this section would benefit from a replication study against a representative owner-occupier sample, with attention to the user-facing presentation layer that the present thesis does not address (Section 1.7).

The second is executability tooling research. The interviews identify the executability caveat (Section 5.1.3) and the demand for an executability layer; methodology research on how an executability test can be implemented at the per-dwelling level without inflating the *maatwerkadvies* cost is a natural follow-up.

The third is the cost-and-update mechanism as a business-model question. The interviews identify who pays and what triggers an update as open questions across multiple stakeholders, and the present recommendation in Section 5.3.2 proposes three viable mechanisms with their trade-offs. The detailed business-model design (cost-recovery, fee schedule, subsidy lever, interaction with existing ISDE and energy-label-update fees) is itself a substantial study and a natural follow-up, with a direct connection to the broader RenoDAT research programme into which this thesis fits.

5.4. Limitations

The findings and the recommendations in Section 5.3 carry a number of limitations that bear on how they should be read. Limits that operate inside the coding methodology itself, namely the decision to code member-checked summaries rather than verbatim transcripts, the single-coder setup with its codebook-and-rationale audit trail, and the asymmetry caveat on the spatial-level counts, are documented in the data analysis (Section 3.5) and the codebook (Appendix B), and are not repeated here. What follows is the set of limits that bear on how far the recommendations can be carried outside the conditions of this study.

5.4.1. Sample and selection limits

- **Sample size and generalisability.** With 15 interviews and 17 respondents across nine stakeholder categories, the findings are indicative rather than exhaustive. The in-depth nature of the interviews partially offsets this by letting participants draw on their broader professional experience; several respondents, while primarily advising owner-occupiers, also have experience with other typologies (homeowners' associations, housing corporations), which widens the practical relevance of their building-data perspective. Even so, single-respondent stakeholder categories (one direct volunteer energy-coach respondent in P06, with the energy-coach branch of the cooperative reported indirectly via P17′s account; one one-stop shop in P02; one private landlord in P05) cannot be read as evidence about those categories as a class, and within-group variation in the larger categories is reported per respondent rather than aggregated.
- **Selection bias.** The recruitment route set out in Section 3.3 biases the sample in two foreseeable directions. Professionals already engaged with (or positive about) building-data digitalisation are over-represented, while sceptics, opt-outs, and professionals not adjacent to the RenoDAT or supervisory networks are under-represented. Separately, the two demand-side respondents (P01, and P05 in their homeowner role) are atypical in the way set out in Section 3.3, and their accounts are therefore reported as case material rather than as evidence about owner-occupiers as a class.

5.4.2. Generalisability of the recommendations to the launching Dutch BRP

- **The hypothetical versus the actual Dutch BRP.** The Step 3 prompt used in every interview shows a data-rich hypothetical Dutch BRP, rendered through the parallel-Geomatics MSRD-based data-model artefact (Section 3.4). The Dutch BRP scheme that becomes available from May 29, 2026, by contrast, is the *maatwerkadvies*-based stepwise advisory document described in Section 1.3.1, which is registered in EP-Online but has no post-execution dossier function and no role as a continuously updated record of what has been done to a dwelling. The practitioner expectations elicited in Chapter 4 and the recommendations developed in Section 5.3 are therefore evidence about what stakeholders would want from a fuller, dossier-side Dutch BRP, not direct evidence about the launching scheme. The recommendations in Section 5.3 assume that the launching scheme can and will be iterated toward something closer to the hypothetical Dutch BRP. Where that assumption does not hold, the practitioner expectations reported here may not transfer to the launching scheme one-to-one, because the launching scheme creates a different set of cost, mandate, and certification incentives than the hypothetical artefact respondents engaged with.

5.5. Reflection

Stepping back from the project as a whole, this reflection looks at how the research process went, how it relates to the parallel Geomatics MSc thesis, where it sits within MBE, and where the contribution sits in the broader Dutch renovation transition.

5.5.1. Process: what worked and what did not

Coding member-checked summaries rather than verbatim transcripts was, in hindsight, the right call. Asking each respondent to review a long and unformatted verbatim transcript would not have been realistic. The summaries I wrote, with deliberate care for completeness and nuance, were a more workable artefact both for the member-check pass and for my own re-reading during my coding and analysis. The pass itself produced few substantive corrections; confirmation rather than correction was the typical outcome.

The one ambition I did not meet was a direct interview with a certified EP-*adviseur*, the role on which the launching Dutch BRP scheme is built (Section 1.3.1). Unfortunately, my outreach attempts simply did not yield a participant. The gap is partly closed by the parallel Geomatics MSc thesis, which analyses the EPA software (Vitec Vabi) that EP-*adviseurs* use in practice, so the data-needs profile of the role is reconstructed from the tool side rather than from direct elicitation. With hindsight, this is the recruitment gap I would have prioritised closing over a representative in the better-covered stakeholder categories.

5.5.2. Coupling with the parallel Geomatics thesis

The relationship between this MBE research and the parallel Geomatics MSc thesis on the MSRD data model is sequential more than mutually iterative. The cleaner direction is from Geomatics into MBE, which is the opposite of what I had initially expected. The Geomatics thesis work provided the concrete Step-3 elicitation artefact (Section 3.4) that gave the interviews an object to react to. The reverse direction, from MBE findings back into the MSRD, functioned more as confirmation than as redesign. The practitioner finding that renovation history is the single most consistently named missing element confirmed the MSRD's existing decision to carry it as a foregrounded group of fields, namely the 'renovation layer'. The practitioner findings on multi-resolution and optional fields likewise confirmed its stance on optionality and aggregation of fields. Both design choices were already in place before the MBE coding finalised. The methodological lesson is that a research-design hybrid run on overlapping but sequentially-coupled timelines can give the design a practitioner-confirmation pass, even when it cannot give it a fully iterative one. The value of that confirmation pass should not be overstated as iterative co-design.

5.5.3. Position within MBE

This thesis sits inside the core area of MBE, stakeholder coordination for housing renovation, but approaches it from the data and information side rather than the more common finance and process side. The MBE-side contribution is to show that the data infrastructure underpinning renovation advice is itself a management question, not a technical detail to be settled after the management decisions are made. Completing this thesis alongside its parallel Geomatics counterpart leaves me with two professional directions that sit at the edge of where MBE training usually takes graduates. The first is a data-policy bridge role, working in both qualitative practitioner research and the technical data-model side. The second is a practitioner-grounded policy-advisor role, carrying practitioner evidence into policy conversations as the implications section does. Having produced substantial work on both sides, I see my own position as balanced between the two rather than tilted to one.

5.5.4. Broader context and impact pathway

The 2030 and 2050 renovation targets, set out in Section 1.1, can only be reached through staged renovation carried out by different professionals years apart. That staged nature makes information transfer between successive professionals a practical bottleneck, and the dossier-side findings of this thesis address that bottleneck.

The contribution is modest in scale and specific in form. The interviews identify, at practitioner level, where Dutch renovation-advice professionals see current data sources falling short of what they would need for staged advice over a 15- to 20-year horizon. The recommendations in Section 5.3 translate those findings into design and policy choices that the next iteration of the Dutch BRP could, and in my opinion should, absorb. The parallel Geomatics MSc thesis contributes the data-model side, the RenoDAT consortium [25] sits around both, and BZK, RVO, and the Kadaster carry the design choice itself. Whether the practitioner-grounded reading offered here is taken up in that conversation is not something this thesis can determine; the recommendations of Section 5.3 are offered as input.

A Interview protocol

Regarding the specific building or dwelling data they consider

- Why specifically this data, and not other data (e.g. X)?
- What information is a must-have, and what is nice-to-have?

Regarding their data collection methods and sources

- Could you explain how you typically collect or gather this data in practice?
  - For example: questionnaires, (energy) bills, on-site inspection (visual or more intrusive such as drilling), public registries, the EPC database, sensors, etc.
- Do you typically collect this data (or the data in general) before, during, and/or after renovation?
- Do you use standard forms, checklists, apps, templates, or online platforms during visits?
  - If yes, could you describe or name them?
- Do you ever request historical data, such as the past 12 months of energy bills?

Regarding data unavailability and hardships

- If you cannot collect data yourself, but still need it for accurate advice, how do you deal with that?
  - (Follow-up) Do you estimate data that you cannot directly collect?
- What are the main obstacles to collecting more detailed dwelling-level data?
  - For example: privacy, technical constraints, costs, not the right people.

Regarding data storage and access

- Where do you store the building or dwelling data after collection?
  - For example: digital files, paper files, cloud platform, municipal platform, external platform, etc.
- Do you manage this storage location yourself? Why (not)?
- Do you think it would be useful to have all this kind of data in one centralised location?
  - Would you be willing to contribute to such a storage, even if you had to pay?
- Who has access to this data?
- Do you share the data you collect with third parties (besides the owner-occupiers)?
  - Under what conditions? And if so, what is shared?

Regarding data usage, tools, and advice

- Do you use software or models to automatically (or help you) tailor measures based on the collected data?
- Do you think that also having 3D information (the shape or geometry) of the building or dwelling is of added value?
  - (Optional visual prompt: a 3D building file produced as part of the parallel Geomatics thesis, used for illustration.)
  - Or is this completely unnecessary, and is a PDF print of the Kadaster or floor plan good enough?
- What are the inefficiencies, problems, or extra/redundant work that you have to carry out each time, which feel like a waste of time?
  - Is this due to a lack of data? If so, what if this data were already available?
- What kind of tool would you like to have to support you in your work?

B Codebook

This appendix reproduces the codebook used for the thematic coding described in Section 3.5.

The scheme has four substantive layers (`RESP-*`, `SH-*`, `DN-*`, `BRP-*`) and one cross-cutting set (`X-*` and `BARRIER-*`), kept separate so that *who is speaking* is never collapsed with *what is being talked about*. Inductive codes (added during the first coding pass when a theme recurred in three or more interviews and did not fit cleanly under any deductive code) are noted inline.

B.1 Respondent attribution (`RESP-*`)

`RESP-*` codes record *who is speaking* and are applied per excerpt. For 14 of the 15 interviews the respondent has a single salient role and every excerpt of that interview carries the same `RESP-*` code. The exception is interview 5, where the respondent speaks from three roles (architect, private landlord, and owner-occupier) and the codes shift across excerpts to follow the role that genuinely animates the speech, following the rules described below.

In interview 5 (architect, private landlord, and owner-occupier) the summary opens with the rental case and shifts to the respondent's own home in the second half, so rental-portfolio excerpts carry `RESP-LANDLORD`, own-home excerpts carry `RESP-HOMEOWNER`, and `RESP-ARCH` is retained only on the small number of excerpts where the architectural reasoning is in the foreground.

ID	Code
`RESP-HOMEOWNER`	Homeowner
`RESP-LANDLORD`	Private landlord
`RESP-COACH`	Volunteer energy coach
`RESP-ADVISOR`	EP-advisor / sustainability advisor
`RESP-OSS`	One-stop shop / *Energieloket*
`RESP-GOV-NAT`	National government
`RESP-GOV-MUN`	Municipal government
`RESP-CONTRACTOR`	Contractor / installer
`RESP-ARCH`	Architect / technical consultant
`RESP-CITIZEN`	Citizen initiative / foundation

Table 14: Respondent-attribution codes (`RESP-*`). Own work.

B.2 Stakeholder roles as topic (SH-*)

SH-* codes record *who is being talked about.* They are deliberately a separate axis from RESP-* because respondents constantly speak about stakeholders other than their own role.

ID	Code	Definition
SH-HOMEOWNER	Homeowner (as topic)	Homeowner discussed as audience or object of advice. RESP-HOMEOWNER is used when the speaker is themselves a homeowner. SH-HOMEOWNER excerpts read as professional perception of homeowners as a class, not as homeowner self-reports.
SH-COACH	Volunteer energy coach	*Inductive split* from SH-ADVISOR. Volunteer energy coach, low-threshold peer advisor giving indicative pre-advice without formal certification or NTA 8800 mandate. Hoomdossier-style intake.
SH-ADVISOR	EP-advisor / energy auditor / sustainability advisor	Paid professional advisor: certified energy advisor, EP-*adviseur*, EPA-*adviseur*, energy auditor, *maatwerkadviseur*, sustainability advisor. Produces formal NTA 8800-based or technical advice.
SH-OSS	One-stop shop / *Energieloket*	Regional or municipal *Energieloket*, *Verduurzaamd Wonen*, OSS. *Energieloketten* are increasingly moving toward the OSS model.
SH-TOOL	Online tool / digital platform	*Inductive.* Online consumer-facing platforms or digital tools that mediate building data or advice: VerbeterJeHuis, Hoomdossier, Solvari, comparison platforms (*Bouwgarant*, *Centraal Register Techniek*), *MijnOverheid*, SmartTwin. Distinct from SH-OSS (loket-based service) and SH-INTERMEDIARY (organisations behind the tools).
SH-CONTRACTOR	Contractor / installer	Contractor, installer, insulation or solar-panel firm, roofer.
SH-GOV-NAT	National government	*Inductive split* from SH-GOV. *Rijksoverheid*, ministry (BZK, VRO), RVO, *Wet collectieve warmte* (Collective Heat Act), *Wet gemeentelijk instrument warmte* (Municipal Heat Instrument Act), national subsidies (ISDE), national climate targets.
SH-GOV-MUN	Municipality	*Inductive split* from SH-GOV. Municipality, municipal policy maker, municipal council, alderman, the municipality's district approach, municipal subsidies, municipal *energieloketten* as commissioning party, municipal archive as source-owner.
SH-CORP	Housing corporation	*Split from SH-CORP/VVE.* Housing corporation, social rental sector, professional property owner as social landlord. Distinct from SH-VVE.
SH-VVE	Homeowners' association / collective of owner-occupiers	*Split from SH-CORP/VVE.* Homeowners' association, collective of apartment owners, homeowners' association board. Distinct from SH-CORP.
SH-LANDLORD	Private landlord	Private landlord. Suppressed outside iv 5 by cleanup rule (iv 5 is the only private landlord in the sample).
SH-FINANCE	Bank / financier	Bank, mortgage provider, *Warmtefonds*.
SH-ARCH	Architect / technical consultant	Architect, structural engineer, engineering consultancy. Used for technical or architectural consultancy work as topic; consulting firms producing policy or cost analyses are coded as SH-INTERMEDIARY.
SH-UTILITY	Energy / heat supplier / grid operator	*Inductive.* Energy supplier, heat company, heat supplier, heat-pipeline project (WarmtelinQ), grid operator, distribution company. Distinct from SH-INTERMEDIARY (knowledge actors) and SH-CONTRACTOR (renovation execution).

Table 15: Stakeholder-as-topic codes (SH-*), part 1 of 2. Own work.

ID	Code	Definition
SH-NETWORK	Social network / peer / energy ambassador	*Inductive.* Neighbours, friends, family, peer-residents, word-of-mouth, social proof, energy ambassadors (residents who have already renovated and influence others), *Duurzame Huizendagen*-style peer demonstration.
SH-INTERMEDIARY	Knowledge intermediary	*Inductive.* Research orgs, interest groups, expert suppliers, citizen panels and adjacent actors that shape the data environment without directly advising or building, such as Milieu Centraal (as organisation), Vereniging Eigen Huis, TNO.

Table 16: Stakeholder-as-topic codes (`SH-*`), part 2 of 2. Own work.

B.3 Building-data needs (`DN-*`)

The `DN-*` set captures which building data the stakeholder needs to give informed renovation advice, and at what level of detail. It has four sub-layers: broad categories (`DN-*`), specific fields (`DN-F-*`), specific sources (`DN-S-*`), and spatial levels (`DN-L-*`).

B.3.1 Broad categories

ID	Code	Definition
DN-GEOM	Geometry and envelope	Facade, roof, floor, window and frame surface areas; volumes; orientation.
DN-CONSTR	Construction and materials	Construction year, construction type, wall cavity, material build-up, insulation layer and thickness.
DN-PERF	Energy performance	*Energielabel*, U-values, R_c-values, EP-Online, NTA 8800 scores.
DN-INSTALL	Installations	Central-heating boiler, heat pump, solar panels, ventilation, water heater, heat-emission system, EV charging point.
DN-CONS	Consumption and metering	Gas and electricity consumption, smart-meter data, monitoring data, feeding back.
DN-BEHAV	Resident behaviour	Heating behaviour, occupancy patterns, user behaviour, resident preferences.
DN-COMFORT	Comfort / indoor environment	Indoor climate, damp, draught, per-room temperature, health.
DN-COST	Costs and finance data	Quotation amounts, investment costs, payback time, subsidy amounts.
DN-HISTORY	Renovation and maintenance history	Previously executed measures, maintenance history, replacement cycle.
DN-CONTEXT	Neighbourhood / surroundings	Neighbourhood, trees and shadow, urban context, heat-grid availability.
DN-QUALITY	Data quality	Accuracy, currency, reliability, completeness of data.
DN-SOURCE	Data source / provenance	BAG, EP-Online, Kadaster, supplier, self-measured, *Woningdossier*, RenoDAT.
DN-GRANULARITY	Data granularity / level of detail	*Inductive.* Discussions about the level of detail at which data is needed, collected or aggregated: dwelling, district, or national level, sub-category versus measure, aggregation, per-dwelling precision. Umbrella for the `DN-L-*` codes below.
DN-METHOD	Calculation methodology	*Inductive.* NTA 8800, determination method, certified or attested software, validated calculation protocol. Distinct from `DN-PERF` (the performance outputs).

Table 17: Broad data-need categories (`DN-*`). Own work.

B.3.2 Specific data fields (DN-F-*)

DN-F-* codes specialise the broad DN-* categories by recording the specific building-data fields respondents name. Each DN-F-* code is a specialisation of one parent DN-* category; on excerpts where the specialisation fires, the parent is omitted from that excerpt to avoid double-counting. The parent stays only on excerpts that discuss the category in the abstract without naming a specific field.

ID	Field	Specialisation of
DN-F-YEAR	Construction year / vintage	DN-CONSTR
DN-F-INSUL	Insulation (presence, material, thickness)	DN-CONSTR
DN-F-UVAL	U-values / R_c-values	DN-PERF
DN-F-LABEL	*Energielabel*	DN-PERF
DN-F-GLAZ	Glazing / window frames	DN-CONSTR
DN-F-HEAT	Heating system	DN-INSTALL
DN-F-VENT	Ventilation system	DN-INSTALL
DN-F-PV	Solar panels	DN-INSTALL
DN-F-AREA	Surface areas (facade/roof/floor/heat-loss)	DN-GEOM
DN-F-ORIENT	Orientation / solar exposure	DN-GEOM
DN-F-DWELLTYPE	Dwelling type / position in building	DN-GEOM
DN-F-ELECCONS	Electricity consumption	DN-CONS
DN-F-MONUMENT	*Monumentstatus* / *welstand*	DN-CONTEXT
DN-F-WARMTEPLAN	*Warmteplan* / *aardgasvrij*-context	DN-CONTEXT

Table 18: Specific data-need fields (DN-F-*). All inductive. Own work.

B.3.3 Specific data sources (DN-S-*)

DN-S-* codes specialise the DN-SOURCE category by recording the specific data sources respondents name. The same parent-suppression rule as DN-F-* applies: when a DN-S-* code fires, DN-SOURCE is omitted on that excerpt.

ID	Source	Specialisation of
DN-S-BAG	BAG / 3DBAG	DN-SOURCE
DN-S-LABEL	EP-Online / energy-label registration	DN-SOURCE
DN-S-KADASTER	Kadaster	DN-SOURCE
DN-S-DRAWINGS	Building drawings / municipal archive	DN-SOURCE

Table 19: Specific data-need sources (DN-S-*). All inductive. Own work.

B.3.4 Spatial levels (DN-L-*)

DN-L-* codes specify the spatial level at which data is needed or discussed. DN-GRANULARITY is the umbrella flag that level is being discussed at all; the DN-L-* codes specify which level. Only a minority of excerpts name a level in so many words; most operate at an implicit default, per dwelling for advisors and contractors, aggregated for government. The DN-L-* cross-tab therefore describes asymmetries in *how explicitly* each role talks about level, not a quantitative basis for per-stakeholder "dominant level" claims.

ID	Level	Trigger
DN-L-WONING	Per dwelling / *pand* / building	Dwelling level, premises level, building level, individual dwelling.
DN-L-BLOK	Block / complex / cluster	Complex level, block level, street level, cluster level.
DN-L-BUURT	Neighbourhood / district	Neighbourhood level, district level, neighbourhood scale.
DN-L-GEMEENTE	Municipal / regional	Municipal level, regional level, area level.
DN-L-LAND	National / EU	National level, European level.

Table 20: Spatial-level codes (DN-L-*). All inductive. Own work.

B.4 BRP expectations and concerns (BRP-*)

BRP-* codes capture the practical expectations, concerns, and missing elements that arise in relation to a Dutch BRP, elicited in the closing block of each interview against the Step-3 artefact (see Section 3.4).

ID	Code	Definition
BRP-TRUST	Trust in data and authority	Trust as enabler or disabler of acting on data or advice. Covers institutional trust (trust in source, who guarantees the data, official status, audit) and interpersonal trust in advisors, contractors or peers.
BRP-PRIVACY	Privacy and ownership	Who is owner, anonymisation, sharing with third parties, AVG, opt-in.
BRP-COMM	Commercial sensitivity	*Inductive.* Quotation amounts, price level, competition-sensitive data, supplier interest. Distinct from BRP-PRIVACY (personal data).
BRP-ACCESS	Accessibility for laypeople	Comprehensible to a layperson, low-threshold, language use, visualisation.
BRP-USABILITY	Usability and interface	Single location, mobile-readable, dashboard, interaction.
BRP-COMPLETE	Completeness	Which fields belong inside, missing elements, scope of the passport.
BRP-UPDATE	Update mechanism	Keeping current, who updates, update frequency, version control.
BRP-STANDARD	Standardisation	ISO, NEN, open standards, shared definitions, interoperability.
BRP-INTEGRATE	Integration with existing systems	*Energielabel*, BAG, *Woningdossier*, *MijnOverheid*, linking with existing tools.
BRP-ACTION	Actionability and roadmap	Action plan, roadmap, measure package, prioritisation, monitoring.
BRP-ADOPT	Adoption and scalability	From early adopter to mainstream, 5-10% to 90%, threshold to use.
BRP-COSTBRP	Cost and payer of the BRP	*Inductive.* Who pays the passport, subscription, public funding, free at sale. Distinct from DN-COST (general cost data).
BRP-EPBD	EPBD references	*Inductive.* Explicit references to the EU directive that mandates the Dutch BRP: EPBD IV, EPBD III, the directive itself, or its obligations on member states.
BRP-ZEB	Zero-emission building goal	*Inductive.* The ZEB target toward which the BRP roadmap points. Captures the definition debate, the 25-year horizon, and the 3-step no-regret interpretation.

Table 21: BRP-expectation codes (BRP-*). Own work.

B.5 Cross-cutting (X-*, BARRIER-*)

Cross-cutting codes capture themes that overlap sub-questions and are applied alongside the SQ-specific codes, not instead of them. The four BARRIER-* subtypes are inductive promotions underneath X-BARRIER, applied in combination: a generic barrier mention without a classifiable subtype is not coded.

ID	Code	Definition
X-MOTIV	Motivation / driver	Explicit statement by the respondent of a driver, value or reason that moves them or another stakeholder to act, including efficiency-of-action arguments. Includes intrinsic and extrinsic motivation, sustainability values, comfort, costs.
X-BARRIER	Barrier / obstacle (generic)	Generic barrier flag. Applied alongside one of the BARRIER-* subtypes; a generic barrier mention without a classifiable subtype is not coded.
BARRIER-SUPPLY	Barrier: supply side	*Inductive.* Contractors, installers, advisors unable or unwilling to deliver, capacity shortage, waiting lists, certification gaps.
BARRIER-DEMAND	Barrier: demand side	*Inductive.* Resident, homeowners' association or housing corporation that does not move: ignorance, inability, behaviour, affordability, acceptance.
BARRIER-REG	Barrier: regulatory	*Inductive.* Regulation, monument or *welstand* conflicts, AVG/privacy rules, permits, policy contradictions.
BARRIER-DATA	Barrier: data	*Inductive.* Missing, wrong or non-linkable data, quality gaps, data-model mismatches, interoperability.
X-POLICY	Policy / regulation	Policy, regulation, subsidies, permits, ISDE, net-metering scheme.
X-PIONEER	Pioneering / early adopter	Pioneer role, ambassador, early user, social flywheel.
X-COLLECTIVE	Collective / district-level approach	*Inductive.* District approach, neighbourhood approach, district implementation plan, collective procurement, joint sustainability work; counterpart of individual advisory trajectories.
X-LIABILITY	Liability / accountability	*Inductive.* Formal legal or financial responsibility for data, advice or outcomes: liability, AFM permit, insurance, legal exposure. Distinct from BRP-TRUST, which concerns credibility rather than legal responsibility.

Table 22: Cross-cutting codes (X-* and BARRIER-*). Own work.

B.6 Coding conventions

The conventions below apply across all layers. They are reproduced here for appendix self-containedness; the rationale is in Section 3.5.

- One primary SQ code per excerpt where possible; cross-cutting codes may be added.
- Prefer the narrower code; fall back to a broader one (DN-CONTEXT, SH-INTERMEDIARY) only when nothing more specific fits.
- Inductive promotion threshold: a theme that recurred across three or more interviews and did not fit cleanly under any deductive code was promoted as a new code, flagged inline in the tables above.

- Quote boundaries follow whole meaningful utterances of roughly one to five sentences; paragraphs are split only when different parts carry clearly different codes.
- Every coded excerpt carries a one-line rationale that justifies the code choice; these rationales form the audit trail.
- Counts in cross-tabs are coded excerpts, not respondents. A multi-theme utterance can carry several codes, and a respondent who returns to a theme contributes to that theme each time. Frequencies are frequency-of-mention, not number-of-stakeholders-who-hold-the-view.

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