WEii
EnergieKompas

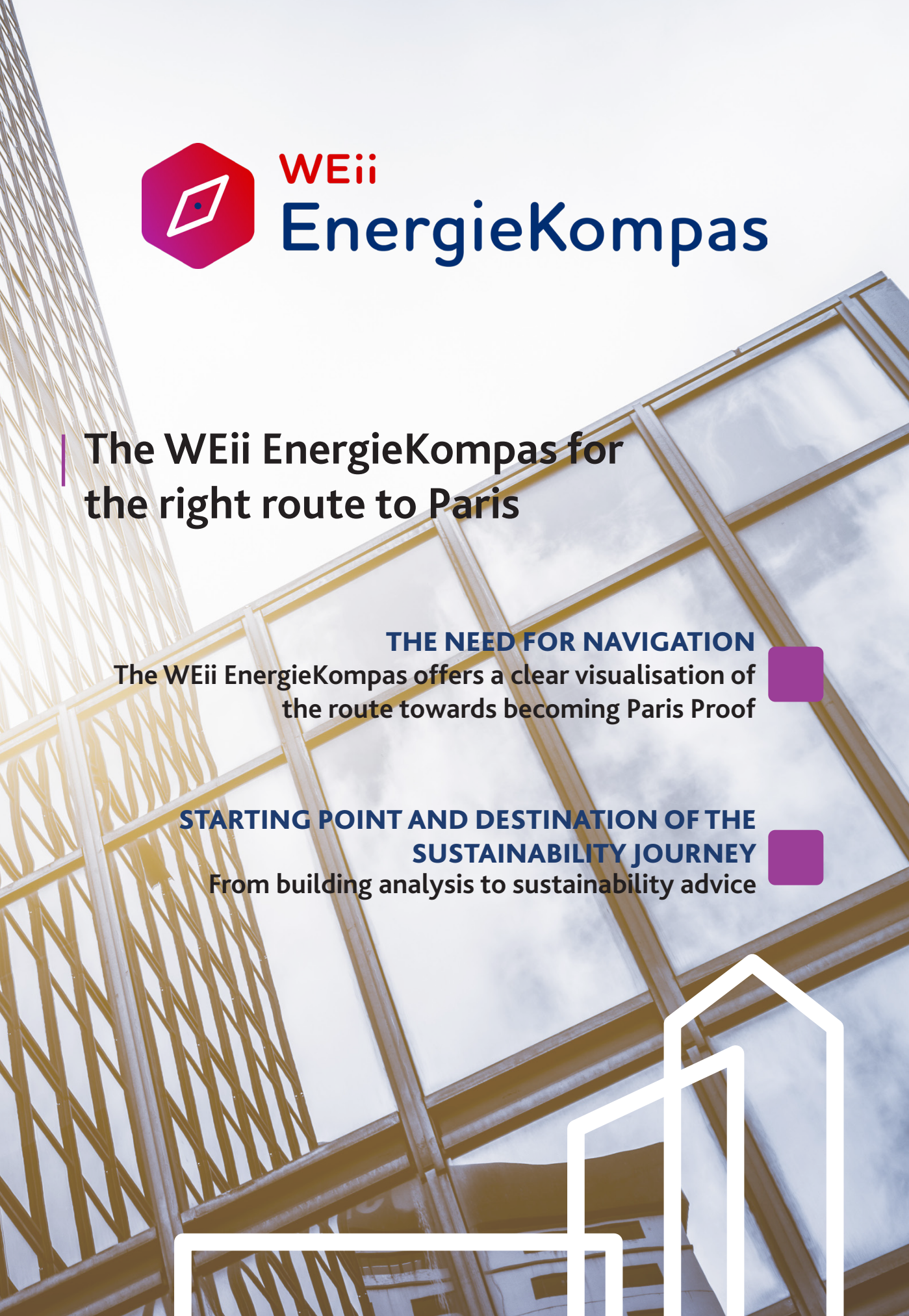
The WEii EnergieKompas for the right route to Paris

THE NEED FOR NAVIGATION

The WEii EnergieKompas offers a clear visualisation of the route towards becoming Paris Proof

STARTING POINT AND DESTINATION OF THE SUSTAINABILITY JOURNEY

From building analysis to sustainability advice



Authors Bert Elkhuizen INNAX/TVVL and Martin Mooij (DGBC)

The WEii EnergieKompas for the right route to Paris

Meeting the goals of the Paris Agreement is a significant challenge. In the built environment, we must accelerate our efforts to reduce CO_2 emissions. A key factor in achieving this is standardisation. Not only in product development but also in the sustainability process and the communication surrounding it among stakeholders. The WEii EnergieKompas (Energy Compass) was developed to serve as a standard for gaining insight and facilitating dialogue around energy savings and CO_2 reduction in the built environment.

In the Netherlands, both new build and existing buildings are subject to calculated energy performance. The so-called asset rating. For many years, the market has relied on this rating system to express the energy efficiency of existing buildings through a calculated energy label.

More recently, the Dutch Green Building Council (DGBC) and TVVL (a member of REHVA) developed an additional indicator to reflect a building's actual energy performance: the WEii (Werkelijke Energie intensiteit indicator/real energy consumption indicator). This is an operational rating that translates measured energy consumption from the main meter into kWh per square meter of usable floor area.

The need for navigation

It is encouraging to see that interest in setting targets and ambitions based on measured energy use is growing in the building sector. Both the WEii and target-setting based on measured energy consumption are gaining traction. However, this change has also led to some confusion, prompting questions like: Should I focus on energy labels (asset rating), on the WEii (operational rating), or both? Is a green energy label sufficient? What insights can the WEii provide? Where should I start?

Just like we depend on navigation systems in our cars to get us to our destination efficiently, we also need smart guidance when navigating the journey of improving energy performance in buildings. Currently, no such guidance exists. Instead, we often rely on trial and error to compose measures that might meet our goals. Today, energy consulting is still often very simplistic, comparable to navigating a road trip with a Michelin road map in hand.

Within TVVL and DGBC, the idea emerged to develop a navigation instrument to solve the issues outlined above and offer more clarity. The WEii EnergieKompas is the result of this effort.

Explanation of the WEii EnergieKompas format

The core philosophy behind the WEii EnergieKompas is that it's not a matter of choosing between asset rating and operational rating, but rather combining both. It's not OR, but AND. Use the calculated energy label AND the WEii. With both legs working together, we'll reach Paris faster!
In Figure 1, the WEii EnergieKompas format is illustrated. The vertical axis shows the WEii score (based on measured energy use), while the horizontal axis displays the calculated energy label. The line on the graph represents the optimal relationship between these two instruments.

The scale for the WEii score is based on the average across all building functions [1], making it broadly applicable and visually usable regardless of building type. However, the actual WEii values and corresponding energy label classifications vary depending on the building function or a combination of functions. The WEii represents measured energy use per square metre (kWh/m²). The energy label, on the other hand, is calculated and currently based on primary fossil energy use per square metre in the Netherlands.
The next diagram provides a classification framework for operational performance, with data specific to office buildings. These values will differ for other building types.

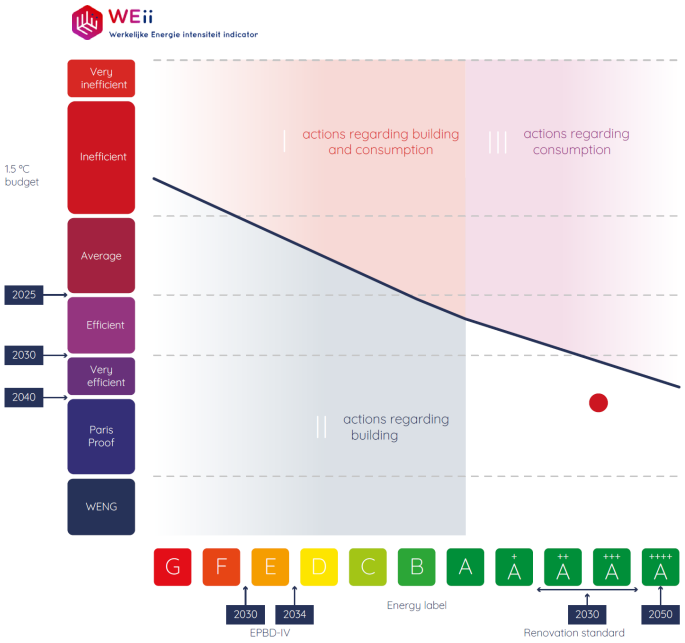


Figure 1: *Visual of the WEii EnergieKompas*

Starting point and destination of the sustainability report

The WEii EnergieKompas helps determine the starting point of a building's sustainability journey. In many cases, both the measured energy use and the energy label are already known, allowing a building's initial placement on the WEii EnergieKompas to be easily determined. To chart a course, the desired destination must also be plotted. In Figure 1, an orange dot represents this goal: an energy label that aligns with 2050 legislation and measured energy use that meets Paris Proof standards. Within the WEii framework, this corresponds to the level of a Zero Emission Building (ZEB).

But the endpoint isn't the only important factor—the speed at which we reach it also matters. The WEii EnergieKompas can also be used to visualise interim targets. In the example shown, milestones are mapped out for achieving Paris Proof by 2040, with portfolio-level targets like WEii Efficient in 2025 and WEii Very Efficient by 2030, supporting alignment with the 1.5°C carbon budget. [see box on page 4]

There is, of course, a connection between energy labels and the WEii scores. This relationship can be modelled using energy simulation tools. However, many of these tools struggle to accurately predict real-world energy use, a challenge referred to as the energy performance gap. In practice, energy models often overestimate actual consumption. To address this, the WEii EnergieKompas bases the relationship between the WEii and energy labels on actual measurement data from buildings in the Netherlands. Research institute TNO examined this relationship using national datasets. More on that later in the article. This sensitivity between the WEii and energy labels is illustrated in Figure 2 by the blue downward-sloping line.

Navigating

A key function of the WEii EnergieKompas is helping building owners and managers determine the most effective strategy for making their buildings more sustainable. Common questions that arise include: Should I focus solely on improving the energy label; does reaching energy label A automatically mean the building is Paris Proof in terms of actual energy use; how can I avoid so-called "regret measures"; are there other, more efficient ways to reduce energy consumption? To support strategic decision-making, the WEii EnergieKompas is divided into four quadrants. Based on a building's position within these quadrants, a general course of action can be identified:

Quadrant I: High energy use relative to the energy label.
Action: Investigate and solve the causes of high energy consumption and then upgrade the building (improving the energy label).

Quadrant II: Green energy label, but energy use remains too high. Investing in an even better energy label is not immediately recommended.
Action: Focus on identifying and resolving the causes of high consumption

Quadrant III: Poor energy label with energy use aligned to that level
Action: Sustainability efforts should mainly focus on upgrading the building (improving the energy label).

Quadrant IV: Both energy label and measured use are near Paris Proof targets
Action: Analyse the final steps needed to fully meet the targets.

Zooming in on office building data

To fine-tune the WEii EnergieKompas, a dedicated analysis was commissioned to TNO [3] for the office building sector, using national data. The study included data from 5,227 office buildings, of which 93.3% are equipped with gas boilers and 5.4% use electric heat pumps.

The main finding was that while there is a relationship between the WEii and energy labels, it is not a one-to-one correlation. Factors like outdoor climate, occupancy, and climate system efficiency all influence actual performance, and these are not always accurately captured in simulation models. Figure 2 illustrates this relationship, showing the percentiles as well as the average trend (50th percentile). The data reveals a wide variation around the average, with many contributing factors that go beyond the scope of this article. One important takeaway: achieving a certain energy label does not guarantee Paris Proof performance based on actual, measured energy use. For example, among office buildings that already comply with the Renovation Standard / label A+++, only 30% meet Paris Proof standards, meaning 70% do not. So, in addition to meeting the energy label Renovation

Renovation standard

The Renovation Standard is a voluntary guideline for improving the energy performance (energy label) of non-residential buildings. It acts as a benchmark through 2030, particularly for buildings undergoing major renovations. Its objective is to bring existing buildings up to the energy performance level of current new construction. Buildings that meet the Renovation Standard by 2030 will be considered ready for 2050, with no further renovation needed to meet future regulations. In contrast, buildings that do not comply by 2030 will face stricter final performance requirements in 2050, which will be aligned with Zero Emission Building (ZEB) targets. More info: https://www.rvo.nl/onderwerpen/renovatiestandaard

WEii and the 1.5 and 2 degrees CO_2 budget

WEii is a practical, market-adopted tool that offers clarity and reliability. It provides the government with confidence that CO_2 reduction targets will truly be achieved.

The target set by the EU and the Netherlands of a 55 percent CO_2 reduction by 2030 is within reach if we aim for an average WEii classification of Efficient by that year. This aligns with the 2-degree target. However, to stay aligned with the more ambitious 1.5°C target, further acceleration is needed. Following a stepped approach—Efficient by 2025, Very Efficient by 2030, and Paris Proof by 2040—keeps us roughly within the remaining global CO_2 budget. See [5].

Standard, operational excellence is also necessary, from systems, buildings, and users alike.

What is the average sensitivity of the WEii to the energy labels at different percentiles in offices:

10th percentile: 4.5 kWh/m² reduction per label category
50th percentile: 7.5 kWh/m² reduction per label category
90th percentile: 10 kWh/m² reduction per label category

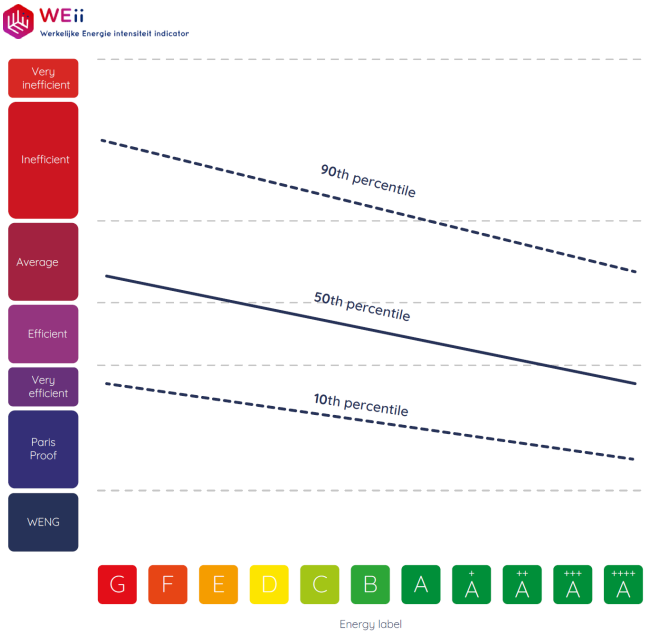


Figure 2: *Relation between the WEii and energy label for offices*

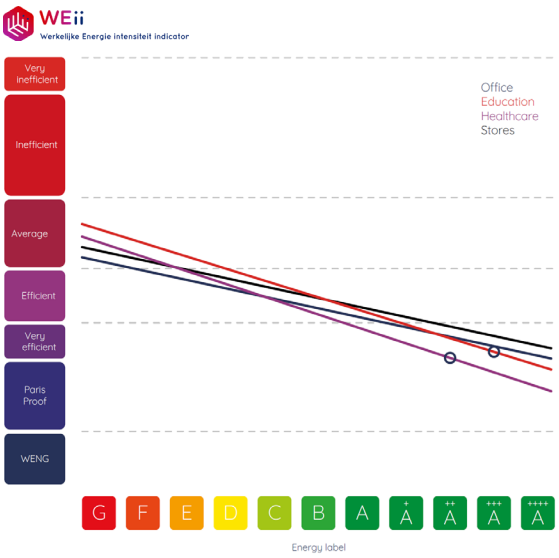


Figure 3: *Average relation between WEii and energy label for four building functions*

Most of the reduction in WEii comes from reduced gas consumption. The most impactful interventions include better insulation and the introduction of electrical heat pumps. Electricity use tends to remain relatively constant across label categories. Energy savings from measures like LED lighting and solar panels are often offset by added electric demand from heat pumps or changes in building usage. For a more detailed analysis of these trends, see [3].

How will the results be used in the WEii EnergieKompas?

In the WEii EnergieKompas, we need outlines showing how measured energy consumption across the building stock decreases on average as the energy label improves. To define the navigation line in the WEii EnergieKompas (i.e., the relationship between WEii and energy labels), we use the 50th percentile and multiply it by 1.25. This accounts for existing operational inefficiencies in buildings [6], which we intentionally exclude from the navigation baseline.

The sensitivity of the relationship between WEii scores and energy labels has been determined using national datasets. Ultimately, we also define the endpoint of the journey toward Paris. This endpoint is defined as an energy label that meets the Renovation Standard and a measured energy consumption that complies with Paris Proof. For office buildings, this corresponds to a final energy consumption of 70 kWh/m². This benchmark is shown as the orange dot in Figure 1.

How does this apply to other building functions?

The relationship between WEii scores and energy labels has also been analysed for other building functions, based on a separate TNO study [2]. Here, too, the 50th percentile was used as the key reference point.

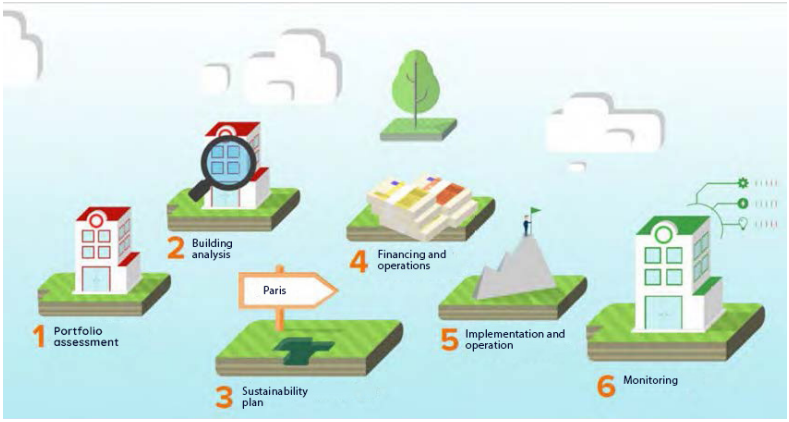


Figure 3: *Step-by-step plan for building sustainability*

The result is that the absolute numerical values per energy label category differ per building function. However, when this is plotted in the WEii EnergieKompas (where each building function has unique numerical values per WEii class [1]), the trend lines are closely aligned. See Figure 3.

These insights help in making choices. We aim for an WEii EnergieKompas that can be used across multiple building functions and can also plot building portfolios with a mix of building types. Since the trend lines are close together, the WEii EnergieKompas can be presented with an average line, with only a minimal margin of error.

The final version of the WEii EnergieKompas is based on averaged data from the most common building functions (offices/education/healthcare/retail).

How can the WEii EnergieKompas help us in the sustainability challenge?

Making the energy label and WEii score visible is essential for navigation. However, some building sectors still lack sufficient energy label coverage. To prevent this from becoming a show-stopper, we are developing a method for these sectors to estimate an indicative energy label so that stakeholders can still get started with the WEii EnergieKompas in the meantime.

Step-by-step plan for building sustainability

Figure 4 illustrates a logical step-by-step approach to making buildings more sustainable, developed by the Dutch Green Building Council (DGBC). The WEii EnergieKompas can be applied at every stage of this process.

Step 1: Portfolio assessment

For property owners with a diverse building portfolio, it can be challenging to determine which buildings to prioritise. Each building has its own characteristics —so where are the biggest savings to be achieved? The WEii EnergieKompas provides a fast and straightforward way to gain insight into this. Figure 5 shows an example portfolio consisting of eight buildings.

Step 2: Building analysis

Using the portfolio overview, the relative positioning of each building becomes clear. Every building is positioned into one of four quadrants. The vertical axis is centred around energy label A, which is the minimum threshold for a "green building" under the EU Taxonomy. The quadrant a building falls into defines the strategy for further analysis and the type of energy-saving measures required.

In the example shown in Figure 6, we take a closer look at a specific building. At the starting point, it falls within Quadrant I, which means energy-saving efforts should focus on both (1) operational measures and (2) technical energy saving measures. Without the need for extensive, costly analysis, the WEii EnergieKompas combined with the diagonal trend line, already reveals that for this specific building, simply improving the energy label will not be enough to reach Paris Proof status based on measured energy use.

Figure 5: *WEii EnergyKompas for a complete building portfolio*

To better understand the building's high annual energy consumption, smart meter data is analysed using the energy signature method. This reveals a number of operational issues with the HVAC-systems and how the building is used. Addressing these lowers the energy consumption, but doesn't affect the energy label. As a result, the building moves vertically within the WEii EnergieKompas.

To identify asset-based energy-saving measures, energy models (asset rating models) can be used to calculate potential improvements in the energy label. However, one should be cautious when interpreting the estimated savings from these models. The results must be carefully calibrated against the building's actual energy use.

Step 3: Sustainability plan

The results from analysing (1) smart meter data and (2) asset based measures can be plotted in WEii EnergieKompas, showing how each measure impacts both the WEii score and the energy label. The WEii EnergieKompas serves as a solid foundation for developing a sustainability roadmap, both for the overall portfolio and for individual buildings. See Figure 7.

Step 4: Financing and operations

In this phase, the WEii EnergieKompas also plays a crucial role. Demonstrating that a building is on track to meet Paris Proof standards reduces the risk of financial devaluation, known as the "brown discount." This helps owners avoid negative financial balance sheet impacts— or even unlock added value. Moreover, the WEii score can be translated into projected energy costs, making the WEii EnergieKompas an integral part of the business case for sustainability and a key component of the investment memo for CFOs, executives, or lenders seeking financing or lease agreements.

Step 5: Implementation and operation

In this step, the WEii EnergieKompas becomes relevant during initial commissioning. Going forward, WEii scores under standard operating conditions should be included as a KPI in implementation and operation contracts. During commissioning, WEii can be measured over a defined period and serve as a delivery criterion for renovation projects.

There are several reasons why the measured energy consumption can no longer be treated as a non-binding aspect of building commissioning: (1) the significant energy costs, (2) the impact on property value and financing options, (3) the Corporate Sustainability Reporting Directive (CSRD), under which auditors verify KPIs including measured energy use. With growing accountability for actual energy performance, pressure to deliver measurable results is increasing.

Figure 6: *Course of action is determined by the quadrant of the building*

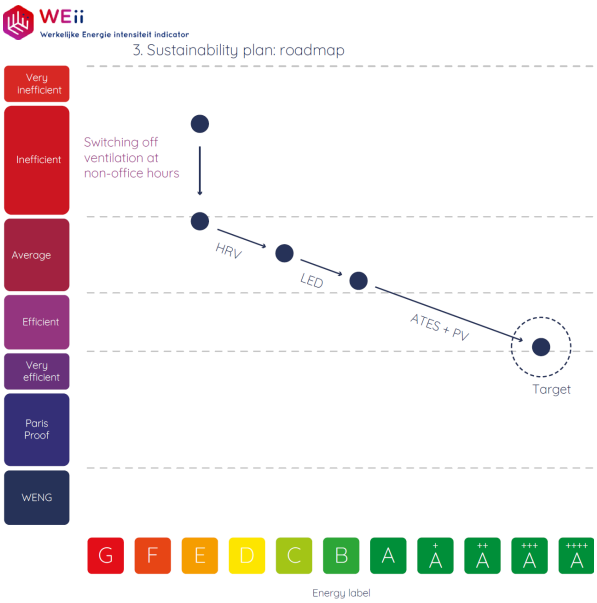


Figure 7: *Image of the sustainability plan in the WEii EnergieKompas*

Step 6: Monitoring

Too often, energy-saving plans rely on predictions, but are not followed up with real-world checks to confirm whether those predictions are achieved. Verification brings two key benefits: Firstly, it ensures the building gets the full potential from the implemented measures. Secondly, it builds valuable knowledge on the real-world impact of various measures; which measures are really effective to lower the energy consumption? Historically, energy advice has relied heavily on model-to-model comparisons, neglecting validation against real-world data (model-to-measurement comparisons).

For active monitoring and verification, the WEii EnergieKompas is again a practical tool. With quarterly reports to management and annual reporting to auditors, it ensures ongoing attention to Paris Proof status and related KPIs. This gives the WEii EnergieKompas a strategic positioning in organisations.

In the example shown in Figure 8, active monitoring reveals that most measures deliver results in line with the sustainability plan. However, one final measure (e.g. installing an Aquifer Thermal Energy Storage (ATES) system) yields significantly less energy savings than projected. This immediately triggers a re-commissioning of the ATES system. After optimisation, the system performs as expected.

Had the WEii EnergieKompas not been used for verification, this issue might have gone undetected. The takeaway: never skip the quarterly verification step during the operational phase.

Software development

It has been decided not to keep the WEii EnergieKompas as a standalone tool but to integrate it within the WEii methodology. As such, the WEii EnergieKompas becomes a form of expression of the WEii. All relevant information will also be made available on www.weii.nl, which reflects the collaboration between TVVL and DGBC. The WEii calculator on the WEii website also generates the output of an WEii EnergieKompas. In addition, many parties already offer or use software that integrates the WEii EnergieKompas via an API connection to the WEii calculation engine. With the WEii EnergieKompas, the way of communicationg about energy savings has been standardised in the Netherlands.

Certification

While WEii calculations are intentionally straightforward—one of their key strengths—errors can still occur. Building and energy data registers are often incomplete or not fully aligned, which makes fully automated calculations unreliable. For example, discrepancies can exist in surface area measurements or the classification of building functions. As a result, human verification will always be necessary.

Market parties with a license can issue certified WEii scores for buildings. These parties have completed the WEii training and passed an audit, qualifying them to correctly apply the methodology using accurate data. A certified WEii score provides assurance to all stakeholders (e.g., an authority or accountant) that the result is objectively and correctly determined.

Figure 8: *Active monitoring of the realized energy reduction in userphase*

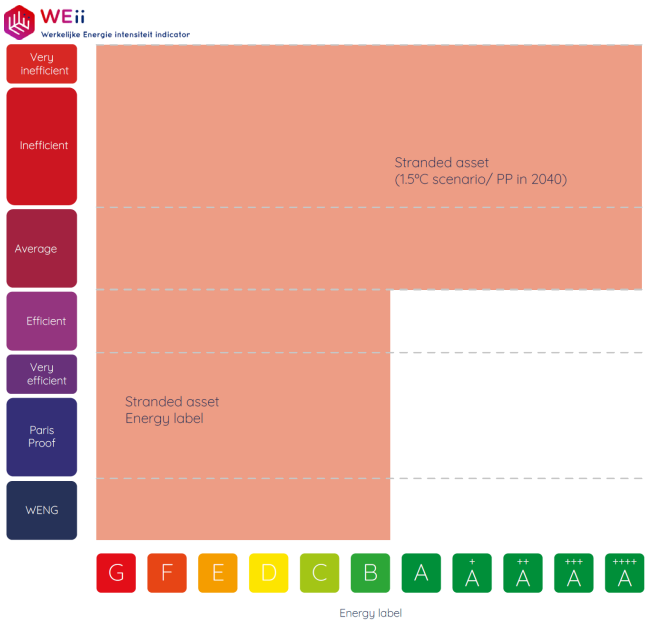


Figure 9: *Example of stranded asset overview in the WEii EnergieKompas for an office in 2025 wit the 1.5 degree scenario as a target.*

Where else can the WEii and the WEii EnergieKompas play a role?

Sustainability reporting

Across Europe, companies are facing stricter requirements to report annually on sustainability performance. One of the most prominent frameworks is the Corporate Sustainability Reporting Directive (CSRD), which emphasises energy savings and CO_2 reduction. The WEii and the WEii EnergieKompas can be used as standardised tools for reporting on progress in these areas.

CRREM

In 2018, the EU CRREM (Carbon Risk Real Estate Monitor) project was launched by organisations such as APG, PGGM, and GRESB. Within the CRREM project, pathways have been established for the energy use and CO_2 emissions of commercial sectors to remain within the 1.5-degree carbon budget. Investors report their progress on energy savings and CO_2 reductions. To avoid being classified as a "stranded asset," a building's energy use and CO_2 emissions must remain below the established pathway thresholds. A stranded asset will lose part of its value (a "brown discount") because it does not comply with the pathway. The formats of the WEii and the WEii EnergieKompas can serve as a basis for CO_2 pathways or for identifying stranded asset zones.

Thanks to the coordination between CRREM and Paris Proof, the reduction pathways of both initiatives are very closely aligned for the Netherlands. The small differences that do exist are compensated by locally generated and used renewable energy: CRREM includes it, while WEii does not. To address this, WEii has introduced an additional indicator ($WEii_{Finaal}$) that aligns with CRREM's methodology. This ensures that CRREM pathways are recognised as Paris Proof within the WEii framework (as shown in Figure 10).

Figure 10: *CO_2 reduction path to meet the Paris agreement goals*

Conclusion

The development of the WEii EnergieKompas fulfils a growing need for clear guidance and communication around energy savings in buildings. The market will benefit from greater adoption of standardised approaches, and the WEii EnergieKompas is introduced here as a communication standard. Therefore, we strongly recommend avoiding the creation of alternative formats, as this would lead to confusion and inconsistencies across the market. The official graphical format of the WEii EnergieKompas can be requested from TVVL or DGBC. As highlighted in the TNO report [3] and during the development of the WEii EnergieKompas, data on buildings, energy labels, and usage are often incomplete or poorly structured. There is still a lack of reliable insight into the actual, achievable energy savings of various measures. Continued development of energy-saving methods based on "evidence-based" approaches is therefore recommended.

References

1. WEii protocol v3.0; January 2022
2. TNO 2021 P10330; "De zoektocht naar een gelijkwaardig alternatief op basis van het werkelijk energiegebruik, als equivalent voor de 'BENG2 Eindnorm 2050' binnen de utiliteitssector"; Sipma; October 22, 2021
3. TNO 2022 P12077, "Het werkelijk energiegebruik van kantoren in het jaar 2019, opgedeeld naar EPA labelklassen, als input voor de ontwikkeling van een EnergieKompas door INNAX, TVVL en DGBC"; Sipma; October 28, 2022
4. Examples of practical applications of the WEii EnergieKompas at INNAX and Nieman https://www.weii.nl/voorbeelden-13
5. WEii als sturingsinstrument om binnen het 1,5 graden budget te blijven, DGBC May 2022
6. TNO Bouw en Ondergrond: P.A.Elkhuizen, J.E.Scholten / Halmos B.V: J.De Knegt, L.Deutz, E.G.Rooijakkers, April 2005 – SenterNovem. Study: "Kwaliteitsborging van installaties, Evaluatie van bestaande instrumenten en een visie voor de toekomst".

The WEii EnergieKompas is an initiative by:

DGBC Dutch Green Building Council

www.dgbc.nl

TVVL

www.tvvl.nl

www.weii.nl/energiekompas
+31 (0)88 - 55 80 100
helpdesk@weii.nl