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Democratising the energy transition in Morocco: an analysis of the framework for decentralised self-generation through the lens of energy justice

Meriem SALHI¹, Mohamed Aissam KHATTABI²

¹PhD student: Team: Data Science, Innovation and Development, Abdelmalek Essaâdi University, Tangier, Morocco

²Professor: Research Group: Data Science, Innovation and Development, Abdelmalek Essaâdi University, Tangier, Morocco

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ABSTRACT

Morocco's Law No. 82-21 and its implementing decree create legal routes for electricity self-production, but formal eligibility does not establish effective access. This article combines a structured reading of the law, implementing rules and the electricity regulator's published hosting-capacity data with a focused review of research on energy justice, rooftop

solar adoption and collective energy. We examine four stylized applicants — a household, a farm, a cooperative and a small firm — through a sequence of legal eligibility, ability to complete a request, local network access and realized benefits. The regulatory route depends on capacity, voltage and connection conditions; potential savings also depend on consumption timing, financing and the applicable rules for surplus sales. Approved cumulative distribution hosting capacity rises from 691 MW in 2026 to 1,324 MW in 2030,

but these planning values do not count connected projects or identify beneficiaries. The article specifies which claims follow from legal texts and public data and which require administrative records and household or project-level evidence. It offers a testable framework for assessing whether an opening in energy law becomes equitable participation.

Keywords: electricity self-production; Morocco; energy justice; hosting capacity; solar adoption; territorial governance.

1. Introduction

Morocco's energy transition first came to the fore through large-scale solar and wind power installations and the institutions responsible for developing them. This approach has increased the role of renewables in electricity policy, but it has also raised a separate question: to what extent can ordinary consumers participate in energy production and the savings it brings? The literature on major Moroccan projects highlights that the success of an infrastructure project and local acceptance are not necessarily linked (Hanger et al., 2016; Rignall, 2016). Self-generation shifts this question to the points of consumption: homes, farms, cooperative premises and workshops.

Law No. 82-21, enacted in 2023, regulates this activity regardless of the energy source, voltage level or power output, subject to the safety of the electricity system. Decree No. 2-25-100 of 5 March 2026, published on 9 March and which came into force three months later, sets out the procedures for installation and operation. At the same time, the ANRE published a capacity allocation for 2026–2030 and set a tariff for surplus energy fed into the grid (Kingdom of Morocco, 2023, 2026; ANRE, 2026a, 2026b). This sequence now allows for a more concrete interpretation than that of a mere right enshrined in law.

Our central question is as follows: under what conditions does the self-generation framework enable equitable participation in the energy transition in Morocco? Four questions elaborate on this. Q1 concerns the regulatory entry conditions for different stakeholders. Q2 examines the distribution of potential costs and benefits. Q3 focuses on the clarity and predictability of procedures. Q4 explores the implications of regional capacity limits. We respond through a qualitative analysis of legal texts and public data, without attributing to stakeholders' investment decisions or gains that we have not observed.

The article links the legal study to energy justice. It begins by situating self-generation within the national transition model,

then constructs its analytical framework, examines the rules, explains the body of legislation and compares four typical cases with grid data. The discussion finally returns to what the framework already permits and what remains to be documented empirically.

2. Energy transition and self-generation in Morocco

2.1. A model built around national projects

The Moroccan strategy launched in the late 2000s assigned a central role to national institutions and large-scale projects. The example of the Ouarzazate solar complex served as a benchmark both for raising capital and for the country's international visibility. This approach makes sense from both an industrial and financial perspective: equipment, grid connection and contracts can be coordinated at a national level. Research on Morocco also shows that the institutional organisation and the choice of large-scale projects centralise some decision-making, even when production utilises a resource found across several regions (Rignall, 2016; Prontera & Rubino, 2024).

It is important to distinguish between three forms of centralisation. The first concerns the scale of production facilities. The second concerns the institutions that plan, finance and regulate. The third relates to the power to set priorities and discuss their local impacts. A large power station does not automatically lead to a lack of participation, and a solar panel installed on a roof is not enough to transfer collective decision-making. The study by El Mostafa et al. (2019) involving Moroccan stakeholders shows precisely that opportunities for decentralisation also depend on the flow of information and local capacity to drive projects forward.

2.2. How on-site generation changes the picture

In Law 82-21, self-generation refers to electricity produced to meet the needs of a self-consumption installation; the self-generator may be a natural or legal person who owns the installation or has the right to use it. The sale of surplus electricity is regulated and remains secondary to this primary purpose (Kingdom of Morocco, 2023, Articles 2 and 12). In this article, 'decentralised' describes the location of small installations close to where the electricity is used, particularly photovoltaic systems. The term does not imply that their ownership, financing or governance must necessarily be collective.

A farm whose pumps operate during the day, an SME whose machinery runs during the day, and a household whose occupants are absent during those hours do not have the same consumption profile. The same solar generator can therefore

reduce the need to purchase electricity to varying degrees. Furthermore, a cooperative must decide who bears the investment cost and how the savings will be distributed. These differences even take precedence over issues of tariffs or the grid. Studies on the uptake of solar energy in other countries describe inequalities in access linked to income, housing and local organisation; they shed light on the mechanism without serving as a benchmark for Morocco (Carley & Konisky, 2020; Kraaijvanger et al., 2023).

2.3. From the right to the ability to participate

The existence of a legal procedure removes a key source of uncertainty, but provides neither the funds, nor the roof, nor the capacity to connect to the power station. We therefore distinguish between formal eligibility, the practical possibility of setting up and financing the project, its actual implementation, and the benefits ultimately retained by its participants. This sequence serves as a guiding thread for the rest of the analysis.

3. Energy justice and local governance

3.1. A framework that questions the rules without prejudging the outcomes

Energy justice asks who benefits from changes to the system, who is involved in decision-making, and which situations are recognised by common rules. Jenkins et al. (2016) structure this analysis around distribution, procedure and recognition. Sovacool and Dworkin (2015) show that these questions concern the entire energy chain. We add an explicit territorial dimension: an identical authorisation across the whole territory may lead to unequal opportunities when grid capacity and technical information vary from place to place (Bouzarovski & Simcock, 2017).

Distributive justice here relates to the initial investment, savings on energy bills, the potential value of surplus energy and connection costs. Procedural justice examines access to documents, processing times, technical criteria, the reasoning behind decisions and channels of information. Recognition examines whether a scheme designed around a specific site and a self-generator takes account of the circumstances of tenant households, members of a cooperative or seasonal agricultural uses. Finally, the territorial dimension examines published capacities and their availability at the project's connection point. It does not convert a regional indicator into an individual probability of acceptance.

Table 1. Analytical framework applied to the four research questions.

Dimension	Question examined	Indicators in the corpus
Regulatory access · RQ1	Which regulatory regime applies to the project?	Power, voltage, components, competent authority
Distribution · RQ2	Who bears the costs and reaps the savings?	Investment, time-of-use profile, surplus cap, tariff
Procedure · RQ3	Can the project be assessed in a predictable manner?	Application, study, timeframe, agreement, availability of information
Assessment · RQ1 to RQ3	Which cases do not easily fit the general rule?	Rights of use, collective status, seasonality, management capacity
Territory · RQ4	What spatial constraints affect access?	Capacity per DSO and source substation, reservations, local assessment

Note: The indices refer to verifiable elements within the dataset; they are not scores measured amongst users.

This framework helps to avoid a common confusion between the existence of a right and equality of outcomes. A procedure that is identical for everyone may be predictable, but it can be more costly for an individual household to manage than for a business with a technical department. Conversely, a network restriction may serve a legitimate safety objective whilst still requiring a clear justification and publication. Energy justice serves here to raise questions about the consequences of the rules, not to label every restriction as unfair.

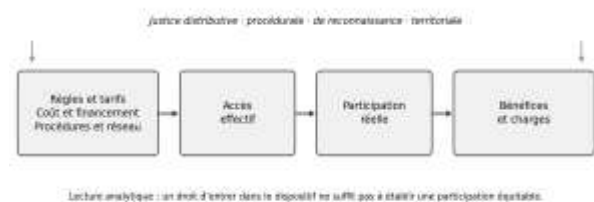


Figure 1. Analytical model of effective accessibility

Source: This article is based on Jenkins et al. (2016), Bouzarovski and Simcock (2017) and Law 82-21. The arrows represent a sequence of analysis and not an estimated causal effect.

4. Literature review and research positioning

4.1. Energy justice and the Moroccan context

Energy justice is no longer limited to the distribution of kilowatt-hours: it also examines the possibility of influencing the rules, being recognised as a legitimate actor and benefiting from a technically accessible system. Recent reviews distinguish between energy democracy, which focuses on collective power, and energy justice, which focuses on outcomes and procedures; they encourage an examination of their overlaps without confusing local ownership with equity (Osička et al., 2023; Wahlund & Palm, 2022; Taiwo & Tozer, 2025; Bauwens et al., 2024). The comparative index developed by Apergi et al. (2024) also highlights the difficulty of quantifying these dimensions using comparable data across the Global South.

In Morocco, research on major projects describes the concentration of decision-making, local negotiations and the tension between the promise of development and the distribution of benefits. Studies by Rignall (2016), Hanger et al. (2016), Cantoni and Rignall (2019), Haddad et al. (2022) and Sabry (2025) shed light on these power dynamics. The study of energy poverty by Kettani and Sanin (2024) shifts the focus to household budgets; Leonard et al. (2024) and Okpanachi et al. (2022) examine the risks of an extractive transition. However, these studies do not measure access to self-generation permits under Law 82-21: this is the gap addressed here. Their methodologies serve to raise questions, without automatically applying their findings to small-scale connected systems.

Table 2. Research on energy justice, Morocco and comparable contexts.

Studies and scope	Findings or approach employed	Relevance and limitations for Morocco
Jenkins et al. (2016); Sovacool & Dworkin (2015); Bouzarovski & Simcock (2017)	Conceptual reviews: distribution, procedure, recognition and spatial dimension.	Provide coding categories; do not measure any Moroccan effects.
Osička et al. (2023); Wahlund & Palm (2022); Taiwo & Tozer (2025)	Syntheses: participation and ownership are not to be confused with equitable sharing.	Distinguish between decision-making power, participation in the system and outcome.

Bauwens et al. (2024); van Bommel & Höffken (2021); Apergi et al. (2024)	Reviews and index: tensions between inclusion, collective governance and measures of justice.	Treat a cooperative as an organisation to be observed, not as proof of equity.
Rignall (2016); Cantoni & Rignall (2019); Prontera & Rubino (2024)	Moroccan institutional analyses: levels of decision-making and the configuration of power.	Contextualise self-production within an already centralised trajectory.
Hanger et al. (2016); El Mostafa et al. (2019); Haddad et al. (2022)	Interviews, stakeholder analysis and political analysis: information, acceptance and contested inclusions.	The transparency of the procedure and the local capacity to deliver a project need to be verified.
Okpanachi et al. (2022); Leonard et al. (2024); Sabry (2025)	Regional comparison, interviews and political economy: local benefits and autonomy cannot be taken for granted.	A new rule should not be equated with an actual redistributive change.
Akrofi et al. (2024); El Hafdaoui et al. (2025); Kettani & Sanin (2024)	African review, national synthesis and survey of household energy expenditure.	Linking access criteria to social heterogeneity without estimating potential demand here.
World Bank (2022); IEA (2022); IRENA (2024)	Transition assessments, financing and equity at different scales.	Contextual sources; do not replace legislation or connection data.

Note. Analytical summary of the publications cited. Findings from other countries do not constitute observations of Moroccan applicants.

4.2. Inequalities in solar adoption

A technology that is cost-effective on average may remain inaccessible to households lacking initial capital, a suitable roof or the legal right to use the site. Meta-analyses and surveys on adoption document the role of income, housing status, information and financing policies (Best et al., 2023; Konzen et al., 2024; Sovacool et al., 2022). The disparities observed in the United States, Europe or in multi-country surveys vary by location and time period (Dokshin et al., 2024; Mahn et al., 2024). Our analysis therefore focuses on transferable mechanisms as hypotheses, rather than on their coefficients or prevalence within the Moroccan population.

Table 3. Comparative results on household access to solar energy.

Studies and fieldwork	Comparative analysis	Variable to be tested in Morocco
Konzen et al. (2024); Best et al. (2023)	Systematic and meta-analytical reviews of inequalities in deployment.	Identify observable factors affecting access, then measure them in Morocco.
Sovacool et al. (2022); Carley & Konisky (2020)	Mixed-methods study and synthesis: the benefits of the transition may be socially selective.	Investment and the distribution of gains must be examined separately.
Borenstein & Davis (2016); O'Shaughnessy, Barbose, Wiser, Forrester, & Darghouth (2021)	Taxation and funding models: incentives and ownership structures alter the distribution.	Assess funding and ownership before inferring a redistributive effect.
O'Shaughnessy, Barbose, Wiser, & Forrester (2021); O'Shaughnessy (2022)	Targeted marketing and incentives: the supply side and the design of support schemes influence take-up.	Examine access to information and service providers, followed by access to credit.
Sunter et al. (2019); Lukanov & Krieger (2019); Gao & Zhou (2022)	US spatial analyses: social and territorial disparities vary depending on the indicator.	Do not confuse regional volume with access for a social group.
Dokshin et al. (2024); Kraaijvanger et al. (2023)	Spatial analyses: local heterogeneity and distinct levels of potential and uptake.	Compare roof area, eligibility, demand, agreement and actual installation.
Wolske (2020); Mahn et al. (2024); San-Martin & Elizalde (2024)	Adopter profiles and surveys: determinants vary across countries and sectors.	Avoid using a single access coefficient for households, farms and SMEs.
Hanke & Lowitzsch (2020); Della Valle & Czako (2022)	Frameworks for the inclusion of vulnerable consumers and energy citizenship.	Design support measures whose impact would then be measured.

Domenig et al. (2024); Hoesch et al. (2024)	Low-income block-of-flats and community solar schemes: ownership and sharing rules matter.	Testing tenancy status and internal rules; foreign schemes do not automatically apply.
HCP (2024); IRENA (2025a, 2025b); IEA (2025)	Socio-economic surveys and published capacity and cost data.	Context for future sampling; no installed prices or individual income data in this dataset.

Note. US and European studies shed light on the mechanisms; no estimates of impact or proportion of adopting households are incorporated into the Moroccan analysis.

4.3. Collective sharing and grid access

The literature on energy communities shows that shared ownership alone does not determine the sharing rule. Depending on the allocation formula chosen, the benefit may be based on financial contribution, consumption, a social priority or an explicit trade-off between efficiency and equity (Gjorgievski et al., 2022; Roberts et al., 2022; Soares et al., 2024; Santos et al., 2025). European models serve as points of institutional comparison: by analogy, they do not create a Moroccan collective self-consumption regime that the texts under consideration would not establish.

Grid constraints require the same degree of caution. Available aggregate capacity is no guarantee at the connection point: topology, voltage, loads, protection, reservations and calculation assumptions all matter (Mateo et al., 2018; Koirala et al., 2022; Rajabi et al., 2022; Ramadhani et al., 2024). Hartvigsson et al. (2023) demonstrate, in a Swedish study, that the unequal distribution of capacity can intersect with social disadvantages. This finding raises a question for Morocco; the study does not describe the distribution of Moroccan applicants.

Table 4. Collective models, sharing rules and network capacity.

Research or data	Contribution to the mechanism	Possible empirical translation
Hanke et al. (2021); Bieligh et al. (2022); Standal et al. (2023)	European studies: communities' promises of justice require evidence of inclusion and impact.	Assessing the actual beneficiaries and decision-making rules of a cooperative.
Gianaroli et al. (2024); Gjorgievski et al. (2021)	Reviews of the social, technical and legal forms of energy communities.	Describing the organisation before comparing collective gains.
Campos et al. (2020); Lindberg & Inderberg (2023); Gallego-Castillo et al. (2021)	Regulatory comparisons: the definition of sharing and network charges affect access.	Do not incorporate European law into Moroccan law.
Fioriti et al. (2021); Norbu et al. (2021); Roberts et al. (2022)	Modelling: exit clauses, ownership and profit sharing affect equity.	Document the internal agreement, members' contributions and exit arrangements.
Gjorgievski et al. (2022); Soares et al. (2024); Dyrge & Cali (2025)	Sharing methods and indicators of distributive justice in local markets.	Testing several sharing keys on real-world curves, without using fictitious simulations here.
Santos et al. (2025); Hoesch et al. (2024)	Model analyses and case studies of community solar schemes: gains and inclusion do not always vary in tandem.	Tracking savings per member and the participation of low-income households.
Mateo et al. (2018); Alnaser et al. (2021)	Grid models: sizing, battery capacity and self-consumption rules alter the constraints.	Examine local integration studies, looking beyond regional caps alone.
Koirala et al. (2022); Rajabi et al. (2022); Ramadhani et al. (2024)	Deterministic, stochastic and spatial methods for assessing grid capacity.	Specify the method, uncertainty, substation and capacity already reserved.

Hartvigsson et al. (2023); ANRE (2026b, 2026c)	The Swedish study combines grid data with social disadvantage; ANRE publishes aggregated Moroccan capacities.	The former suggests the indicator; the latter do not provide the social distribution.
IRENA (2025b); IEA (2025)	International trends in costs and the roll-out of renewables.	Market context; does not replace a local quotation or a bill analysis.

Note. The rules on collective self-consumption discussed in foreign studies are used to compare sharing mechanisms, not as a description of Moroccan law.

5. Institutional and regulatory framework

5.1. Three schemes and distinct connection conditions

The law distinguishes between a declaration, a connection agreement and an authorisation. The decree sets the relevant threshold for a low-voltage connection at 11 kW: below this threshold, a declaration is required; above this threshold, a connection agreement is required for projects ranging up to approximately 5 MW in low- - or medium-voltage systems. A facility of at least 5 MW falls under the authorisation regime provided for in Article 6 of the Act (Kingdom of Morocco, 2023, Articles 3–6; 2026, Articles 5 and 11). The wording of the legislation literally specifies 5 MW as the upper limit for the agreement and the lower limit for the authorisation: this threshold requires an explicit administrative interpretation prior to any application for a project exactly at 5 MW.

The declaration of off-grid sites, not connected to the national grid, is the responsibility of the administration. For a small, connected low-voltage installation, the distribution operator receives a declaration accompanied, in particular, by an electrical diagram, a site plan and a report on self-consumption requirements. The operator verifies the available capacity; the decree provides for an acknowledgement of receipt and an agreement prior to the works (Kingdom of Morocco, 2026, Articles 1–8). For projects subject to approval or authorisation, the technical dossier, the integration study and the network operator's opinions play a more significant role. The application for approval includes, in particular, information on the equipment and past or projected consumption (Articles 12 and 27).

Table 5. Summary of the schemes set out in the Act and the Decree.

Situation	Main line	Decisive factor for access
Site not connected	Declaration to the authorities	Justify the site and production intended solely for own consumption
Low voltage, less than 11 kW	Notification to the distribution operator	Technical dossier, capacity, connection agreement
Low or medium voltage, from 11 kW up to 5 MW in accordance with Article 11 of the Decree	Connection agreement	Technical study, costs and availability of capacity
From 5 MW in accordance with Article 6 of the Act	Administrative authorisation	Technical opinions, potential grid access and agreement

Sources: Kingdom of Morocco (2023, Articles 3–7) and Kingdom of Morocco (2026, Articles 1–27). The classification of a project with a capacity of exactly 5 MW must be confirmed by the competent authority due to the literal overlap of the thresholds.

5.2. Surplus and absorption capacity

Article 12 of the Act permits the sale to the relevant operator of a surplus not exceeding 20 per cent of annual production; a review of the ceiling may be requested under regulatory conditions. This limit relates to the energy produced during the year and does not mean that a project automatically benefits from a paid sale for every kilowatt-hour not consumed. The ANRE has set an initial tariff for the period from 1 March 2026 to 28 February 2027, at 0.21 DH/kWh during peak hours and 0.18 DH/kWh during off-peak hours for the area covered by its Decision No. 04/26. The published decision applies to medium, high and very high voltage connections; this price does not apply to low-voltage domestic installations in the absence of legislation covering such cases (ANRE, 2026a).

Article 14 subjects connected renewable energy installations to the grid's available capacity. Capacity is allocated on a first-come, first-served basis for complete applications. This rule may increase predictability if the dates, capacities and

outcomes of applications are traceable. It may also benefit stakeholders who are prepared to submit a complete application promptly. Article 23 provides for the annual reporting of capacities by grid operators and their publication following approval by the ANRE. The platform published in 2026 provides new information, but an integration study remains necessary for a specific project (Kingdom of Morocco, 2023, Articles 14 and 23; ANRE, 2026b, 2026c).

6. Methodology

6.1. Data set and approach

The study is based on a qualitative and structured review of public documents available as at 27 September 2026. The core of the corpus comprises Law 82-21, enacted in 2023; Decree 2-25-100, published in March 2026; ANRE Decision 04/26; the presentation note on the 2026–2030 capacity; and the corresponding distribution platform. The scientific literature is used to construct the framework and discuss the scope of the results; it does not replace official texts in establishing the applicable law. The period 2023–2026 defines the regulatory change under study. Capacity projections up to 2030 are used solely as such.

Each provision has been linked to a research question and classified according to four statuses: explicitly established rule, published institutional data, conditional analytical consequence, or information not yet available. We then compare four deliberately stylised case studies. The household is represented by a 4 kW low-voltage installation; the farm, by 15 kW; the cooperative, by 30 kW; and the SME by a 100 kW installation. These power ratings are hypothetical values chosen to exceed the 11 kW threshold and highlight the differences between the scenarios. They do not represent observed average sizes nor do they constitute sizing recommendations. In all four cases, we assume that the photovoltaic generation is located at the point of consumption and, subject to a local feasibility study, that connection is possible.

The economic comparison does not calculate financial returns without a quotation, hourly profile, applicable feed-in tariff and connection costs specific to each project. It tracks the flows that should be measured: annual generation E ; the proportion directly self-consumed s ; sellable energy e , where $e \leq 20$ per cent of E and $e \leq$ the actual surplus energy; the price of avoided electricity; the applicable feed-in tariff; and the annualised costs of equipment, maintenance, compliance and financing. In simple terms, the annual net profit depends on $E \times s \times$ avoided cost + $e \times$ feed-in tariff, minus all annualised costs. A significant portion of the surplus may have no sale

value where the legal or technical conditions for sale are not met.

Finally, we note the cumulative national capacities and those of several distribution system operators, with a focus on Tangier-Tetouan-Al Hoceima. The ANRE specifies that the published ‘ ’ capacity depends on technical studies and that commissioned projects are deducted; reserved capacities do not represent operational installations (ANRE, 2026b, 2026c). We are therefore not comparing regional implementation rates. The lack of individual data on applicants, their incomes, the actual waiting times experienced and the final decisions limits any causal conclusions regarding the inequalities experienced.

6.2. Traceability of the corpus and analysis strategy

The final corpus comprises 75 references: 62 journal articles, seven supplementary institutional reports, five central public sources and one working paper. The academic publications were identified through targeted searches on journal and institutional websites, using the terms ‘energy justice’, ‘rooftop solar equity’, ‘collective self-consumption’, ‘hosting capacity’ and ‘Morocco energy transition’, in both French and English, followed by the bibliographies of relevant reviews and DOI identifiers. We retained studies that directly shed light on one of the four mechanisms under investigation; foundational references dating from before 2020 remain in the corpus. This is a targeted review with an analytical focus, making no claim to exhaustiveness and without a PRISMA diagram. The 75 entries in the bibliography do not correspond to 75 Moroccan projects observed.

The selection was based on relevance to one of the mechanisms discussed in the article: fairness of decision-making and distribution, household uptake of solar energy, collective organisation, or grid integration constraints. The Moroccan studies shed light on the institutional context; the international studies provide mechanisms and indicators to be tested, not parameters to be transferred. We distinguished between reviews, surveys and modelling studies, then linked each reference to its contribution and limitations in Tables 2 to 4. No record was kept of the initial number of entries found, duplicates or exclusions. The coding process constitutes a documentary interpretation and does not result in an inter-rater agreement coefficient; the method should therefore not be presented as a systematic review.

The review of the legal corpus focused on articles relating to the definition of a self-generator, thresholds, declaration, agreement, authorisation, surplus and capacity. For each proposed finding, we identify whether the evidence comes

from the legal text, a decision or ANRE data, a mechanism inferred from the literature, or a missing variable. Comparative studies serve to clarify what should be measured; no adoption rates, probabilities of authorisation or annual foreign savings are applied to the four Moroccan case studies.

Table 6. Sources, variables and limitations of inference.

Question	Observation available in the corpus	Data required to measure the effect
RQ1 · entry	Thresholds, voltage, type of application, rights relating to the installation.	Applications submitted and completed, by stakeholder profile and region.
RQ2 · benefits	Legal cap on sales and the ANRE tariff within its scope.	Load curves, costs, financing, pre- and post-transaction bills, ownership status.
RQ3 · procedure	Documents, statutory deadlines, assessment and agreement.	Actual timeframes, fees, supplementary information, reasoned refusals and appeals.
RQ4 · territory	Cumulative capacity per operator and planning horizon.	Capacity at the point of connection, bookings, applications and connections by zone.
Collective cases	Eligibility in principle of the legal entity and comparative literature.	Articles of association, allocation keys, contributions and savings per member.

Note. The last column constitutes a proposed verification protocol, not data collected in this study.

Two checks guide the interpretation. Firstly, a regional total in megawatts is never divided by hypothetical households to produce an access rate. Secondly, the 4, 15, 30 and 100 kW scenarios are not assigned simulated generation or estimated profitability: without individualised load curves, cost estimates and connection details, such a figure would be deceptively precise. This approach enables us to isolate proposals that can actually be refuted in a subsequent investigation.

7. Results

7.1. Regulatory access by stakeholder

RQ1 receives a conditional response. The small 4 kW domestic installation, in our low-voltage scenario, falls under the declaration procedure; the other three cases exceed the 11 kW threshold and fall under the connection agreement. The status of the entity—whether a household, farm, cooperative or SME—is therefore not in itself the criterion that determines the regime. It is the power output, the grid connection and the voltage that primarily determine the procedure (Kingdom of Morocco, 2023, Articles 3–6; 2026, Articles 5 and 11). The same category of stakeholders may follow a different route if their project changes in size or configuration.

The inclusion of legal entities in principle allows a cooperative and an SME to access the scheme. However, to do so, they must be able to demonstrate their right to use the installation and the site, and then describe the consumption that will be covered. For households, the simplified scheme reduces the relative complexity of the application, but does not exempt applicants from providing technical documentation or undergoing a capacity assessment. The term ‘simple declaration’ should therefore not be taken to imply an automatic connection.

Table 7. Four typical cases and their eligibility criteria.

Hypothetical typical case	Usage profile selected	Likely scheme	Condition to be verified
Household · 4 kW · LV	Variable daytime occupancy	Declaration	Site rights, application, local capacity
Agricultural operation · 15 kW · LV or MV	Seasonal daytime pumping	Connection agreement	Seasonal nature, contracted power, feasibility study and cost
Co-operative · 30 kW · LV or MV	Collective uses to be defined	Connection agreement	Asset governance and allocation of savings
SMEs · 100 kW · LV or MV	Daytime production activity	Connection agreement	Hourly profile, network study and financing

Note: Power ratings and profiles are analytical assumptions. LV = low voltage; MV = medium voltage. The precise arrangements depend on the configuration and the application details; no actual applications have been assessed.

7.2. Economic benefits and distribution

For RQ2, the most immediately apparent potential benefit is the avoidance of electricity purchases when generation is consumed on-site. A stable diurnal profile can increase this proportion; a mismatch between sunshine and demand reduces it. In the agricultural context, the irrigation season, pumping capacity and hours of use are therefore more significant than photovoltaic capacity considered in isolation. An SME may have a steady demand but face higher costs for a feasibility study and connection. A co-operative must factor into the financial equation how members finance the asset and share the savings. These proposals are based on stylised cases; they do not rank the four actors by observed profitability.

The 20 per cent cap on annual production prevents the development of a business model based on the unlimited sale of surpluses. Nor does the tariff of 0.18 or 0.21 DH/kWh set for the MV, HV and VHV networks allow for the simulation of a LV domestic income. A comparison of the benefits between market participants would require their bills, load curves, verified quotations, compliance costs and an effective connection agreement. The corpus thus illustrates the possible distribution mechanisms and the list of variables to be observed, not the number of gains per category.

7.3. Procedure and recognition of situations

The answer to Q3 is nuanced. The decree specifies the relevant contacts and describes the required documents, capacity reservation, agreement and technical study. For LV declarations, the confirmation of completion is issued within 30 days of the submission of a complete application, excluding the availability check and reservation, which may take up to 15 days according to Article 8. For larger applications, Article 27 allows up to three months for the technical study from the date of payment of the fees, with a possible extension of 30 days and suspension in the event of a request for further information (Kingdom of Morocco, 2026). These timeframes provide a framework for the process; they do not prove the duration actually observed in each territory.

The procedure also varies according to applicants’ resources. A complete application must include details of the equipment’s specifications, energy consumption and rights relating to the site. An SME may be able to purchase this

expertise, whilst a household or a small cooperative may have to obtain it at a proportionally higher cost. This represents a risk in terms of procedural justice and recognition, not evidence that applications are currently being rejected on these grounds. Publishing model agreements, explanations in accessible language, expected costs and follow-up steps would make it possible to assess and subsequently reduce this risk.

7.4. Capacity and regional differences

RQ4 highlights a discrepancy between the national scope of the rule and the local scale of its application. The ANRE note sets out a cumulative capacity of 3,886 MW for the entire system in 2026 and 10,429 MW in 2030. For distribution networks, the cumulative capacity cited rises from 691 to 1,324 MW. In 2030, the total transmission figure is 9,105 MW; when added to the 1,324 MW for distribution, this brings the total back to the national figure of 10,429 MW (ANRE, 2026b). These figures relate to technical planning, not a tally of household or cooperative projects.

The regional focus highlights the need to look beyond the national level. The cumulative approved distribution capacity for operators in the Tangier-Tetouan-Al Hoceima region totals 100 MW in 2026 – comprising 31 MW for SRM and 69 MW for Amendis – rising to 156 MW in 2030, comprising 60 MW and 96 MW respectively. By way of comparison, Casablanca-Settat will increase from 196 to 375 MW and Drâa-Tafilalet from 18 to 32 MW. This contrast does not constitute a ranking of the regions’ merits: it reflects differences in networks, demand and allocation methods. Availability at the source substation, reservations and the integration study determine access for a specific project (ANRE, 2026b, Tables 4 and 5; 2026c).

A descriptive comparison of the two timeframes complements the regional analysis. The cumulative capacity allocated for distribution increases by 633 MW between 2026 and 2030, representing 91.6 per cent of its initial value; the system’s overall capacity increases by 6,543 MW, representing 168.4 per cent. The share of distribution in this total thus falls from 17.8 per cent to 12.7 per cent. These percentages describe the composition of approved funding allocations, not the implementation of projects or the proportion of beneficiary households. The decline in the relative share does not correspond to a decline in distribution capacity in absolute terms (ANRE, 2026b, Tables 1 and 4).

Figure 3 shows the five published timeframes. Distribution capacity rises from 924 MW in 2028 to 1,324 MW in 2029, then remains at this level in 2030. This trend relates to

approved grid capacity; it does not indicate the number of projects commissioned.



Figure 2. Cumulative integration capacity of the Moroccan electricity system from 2026 to 2030.

Source: Original diagram based on ANRE (2026b), Tables 1, 4 and 5. Distribution corresponds to the capacity allocated to PV by the DSO; transmission includes solar and wind power. The figures are approved and cumulative, not based on installations actually completed.

Table 8. Cumulative capacity allocated for selected distribution areas.

Area	2026 MW	2030 MW	Reading
Casablanca-Settat	196	375	A DSO area
Tangier-Tetouan-Al Hoceima	100	156	Total: SRM 31 + Amendis 69 in 2026; 60 + 96 in 2030
Fez-Meknes	64	152	A DSO area
Drâa-Tafilalet	18	32	A DSO area
Total national distribution	691	1,324	Approved cumulative capacity, excluding completed projects

Source: Calculations based on ANRE (2026b), Table 4. The areas presented are not of the same size nor do they have the same demand; the regional total for the North includes two operators without double counting.

A simple comparison of megawatts does not allow us to attribute an advantage to households in any particular region. The figures summarise the technical capabilities of the network operators and are not related to the number of customers, the applications submitted, or the consumption at the various supply points. In the North, the coexistence of SRM and Amendis clearly demonstrates the importance of consulting the network operator responsible for the project's location. It is then necessary to ascertain the capacities already reserved and to have the connection assessed. The map makes the preliminary assessment stage more transparent; it does not constitute individual approval.

The figures provided by each operator are also subject to revision during implementation. The ANRE guidance provides for allocation between substations operated by the same operator, the use of surplus capacity from another operator with their consent and, subject to conditions, transfers between transmission and distribution (ANRE, 2026b, section 4.1). Table 8 therefore provides a snapshot of the capacities selected for the published timeframes. A survey of actual access should record the capacity at the substation, reservations and any reallocations as at the date of each request.

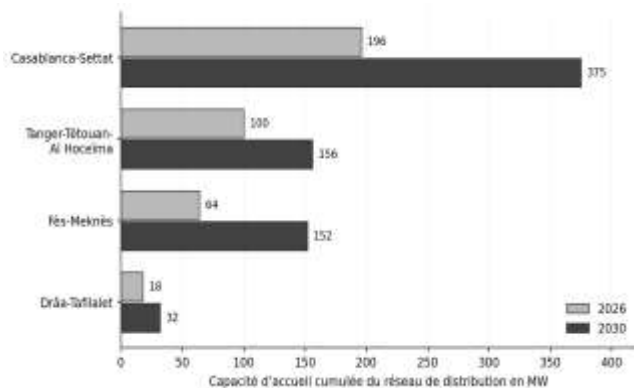


Figure 3. Trend in cumulative capacity across four areas.

Source: Original representation of the figures approved by ANRE (2026b), Table 4. For Tanger-Tetouan-Al Hoceima, the data combines figures from SRM and Amendis. These are planned capacities subject to connection studies.

7.5. Summary of the four questions

The following matrix summarises the conclusions without converting risks into empirical findings. The ‘established’ column indicates an element of the text or data; the ‘to be verified’ column refers to what a survey of applicants and operators should confirm.

Table 9. Cross-cutting analysis of the results by stakeholder.

Stakeholder	What the corpus establishes	Point of justice to be tested
Household	BT declaration for installations under 11 kW; application and local capacity required	Initial cost, occupancy status of the property and low-voltage information regarding the transfer
Agricultural business	Approval from 11 kW upwards in the case studied	Seasonal demand, financing and grid costs
Co-operative	Legal entity eligible in principle; approval granted in the case studied	Collective decision-making, right to install, profit-sharing
SME	Agreement in the case under consideration; technical study and capacity to reserve	Cost of the study and connection, actual load profile

Source: Summary of the literature review. No equity scores or implementation rates are assigned to the categories.

8. Discussion

8.1. A legal opening whose effects depend on resources

Self-generation introduces smaller-scale producers into a system historically structured around large-scale installations. It broadens opportunities for participation, but the body of research does not allow us to conclude that the benefits are already being democratised. Between the law and the outcome lie investment, understanding of the procedure, control over the site, consumption patterns and grid capacity. This distinction aligns with research on inequalities in residential solar power: the same technology does not become accessible to all simply because it is authorised (Carley & Konisky, 2020; Kraaijvanger et al., 2023). It would, however, be inappropriate to extrapolate the levels of inequality measured in Europe or the United States to Morocco.

The rule governing the sale of surplus electricity reinforces the idea that self-consumption must be considered before feed-in revenue. For a low-voltage (LV) household, the absence of an applicable tariff established in the literature for this voltage level precludes a feed-in tariff calculation by analogy with medium-voltage (MV) systems. For a farm, a cooperative or an SME operating at medium voltage, the known tariff

remains just one variable amongst many. The fair distribution of profits is therefore not simply a matter of the price set by the regulator: it depends on the temporal profile of consumption, the cost of capital and the ownership of the asset.

8.2. The grid is part of the governance of the energy transition

Connection capacity reflects a legitimate physical constraint linked to the safety and operation of the system. Its publication nevertheless changes the governance of projects: it makes some of the information available for consultation prior to investment. The ANRE also recognises that distribution methods are evolving and that local studies remain necessary (ANRE, 2026b). The challenge of territorial equity therefore lies in making the scale of the figures, the reservations and the grounds for a negative response explicit. A territory with a high overall capacity may contain saturated sections; the reverse cannot be inferred from a low regional value.

The literature on major Moroccan projects has documented issues relating to participation and the sharing of benefits (Hanger et al., 2016; Rignall, 2016). Self-production raises these same questions in other organisations. A co-operative may involve more members in decision-making, but this possibility must be verified in its articles of association and in its practices, as suggested by the distinction between the organisation of the process and the distribution of outcomes proposed by Walker and Devine-Wright (2008). Local production alone does not guarantee local collective power.

8.3. Implications commensurate with the results

Three courses of action follow directly from the analysis. The first is to publish, for each scheme and each operator, a case history detailing the documents involved, assessment fees, agreements, deadlines and the consequences of a lack of capacity. The second is to support small organisations in drawing up a load curve, verifying their right to use the site and selecting a power rating that matches their needs. The third is to publicly track, by category of stakeholder and by region, complete applications, approvals, grounds for refusal, connections made and processing times, whilst respecting personal data. This information would make it possible to compare the procedural fairness promised with actual experiences.

Our contribution lies in the articulation of four levels of evidence. The law establishes the legal framework; the regulations describe the entry points; the ANRE publishes capacities and a tariff within a given area; and only a survey

of projects and households would ultimately enable us to measure access and the benefits experienced. This final level is missing here. The study is therefore an assessment of the institutional conditions for democratisation, rather than a measure of the extent to which it will have been achieved by 2026.

Future evaluation should track the same projects from one stage to the next. A completeness rate uses the number of applications submitted as its denominator; an approval rate uses the number of complete applications; a commissioning rate uses the number of approvals; and the net benefit relates to the investments and costs borne by participants. These conditional indicators make it possible to identify the stage at which attrition occurs. They must be supplemented by a survey of those who have never submitted an application: the absence of administrative rejections does not prove that initial access is equitable.

8.4. What a survey of applications would enable us to test

An empirical study should measure the progression from one stage to the next for each category of applicant. An anonymised register of applications would make it possible to distinguish between eligibility, a complete application, approval and commissioning; invoices and time-series data would then document the distribution of gains. Linking this data to the location of the substation and socio-economic characteristics, whilst ensuring data protection, would make it possible to test the hypothesis of a cumulative effect of barriers. This data would allow for a comparison of actors with comparable power and voltage levels, and would then enable the effects of funding and network constraints to be estimated separately (Konzen et al., 2024; Hartvigsson et al., 2023; Dyngé & Cali, 2025).

Table 10. Testable proposals for an empirical analysis.

Hypothesis	Measure to be constructed	Result that would invalidate it
P1 · Fixed costs act as a greater filter for small investors.	Rate of complete applications and cost of the procedure relative to power, category and voltage at comparable levels.	Comparable costs and completion rates after taking resources into account.
P2 · The hourly profile determines pre-disposal gains.	Proportion actually consumed on-site and net savings at comparable cost of capital.	No correlation between synchronisation and net savings in the data.
P3 · Capacity transparency improves predictability.	Waiting times, bookings, refusals and reasons before and after publication for comparable posts.	No improvement in response times or the quality of responses.
P4 · A collective allocation key can shift benefits.	Gains per member, contribution, consumption and participation in decision-making.	Distribution remains unchanged across allocation keys, or no effect on members on low incomes.

Note. Research proposals; no tests have been carried out. An identification protocol and access to administrative data would be required to attribute a causal effect.

Figure 4 sets out the denominators required for this assessment. Administrative records can track the stages following submission; identifying those who do not submit any applications and estimating net benefits require additional data.



Figure 4. Proposed observation chain for studying actual access.

Note. Proposed methodological framework for a future study. No sample sizes or completion rates have been observed here. The first denominator requires a defined eligible population; the subsequent steps assume that the same projects are monitored.

In the short term, the measures best supported by the evidence base are modest and verifiable: publishing a single pathway per scheme, clarifying the costs and legal status of the advertised capacities, ensuring bookings are traceable, and providing small organisations with a pre-assessment tool based on their own timetable profiles. For cooperative projects, support should also clarify who invests, who makes decisions and how savings are distributed. These proposals build on existing work on entry costs and collective inclusion (Hanke & Lowitzsch, 2020; Campos et al., 2020; Santos et al., 2025), whilst remaining subject to field evaluation.

9. Conclusion

The Moroccan framework for self-generation enables households, farms, cooperatives and SMEs to participate in electricity generation, in accordance with defined schemes and subject to the technical conditions of the grid. In response to the central question, our conclusion is that this opening up creates an opportunity for broader participation, but that its equitable nature still depends on the stakeholders' ability to finance and set up a project, to consume electricity at the right time and to secure a connection at their site. The surplus cap, the scope of the feed-in tariff and the geographical distribution of capacity give these conditions concrete significance.

Public documents provide no information on self-generators' income, rejected projects or the savings actually achieved. The four case studies highlight points of comparison and do not constitute field observations. A useful empirical follow-up would combine application and connection records with interviews with administrators and surveys of project promoters. It could verify whether the obstacles discussed here actually affect certain stakeholders or regions more than others, and then assess the impact of information and support schemes.

10. Data availability and scope of the study

The capacity figures are taken from Tables 1, 4 and 5 of the ANRE's public report for 2026–2030; the differences and proportions reported are calculated on the basis of these values, without any adjustments or individual data. The legal texts and decisions cited are accessible via the links in the bibliography. No connection applications, bills, surveys or personal data were collected for this study. The empirical

proposals in Table 10 indicate the data required to verify the effects discussed.

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