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A Contribution to Social Acceptance of PV in an Oil-Rich Country: Reflections on Governmental Organisations in Iran

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Abstract: To examine the social acceptance of renewable energy infrastructures regarding their position in the success of energy transition, attitudes towards these technologies have been increasingly recognised to play an important role. Notably, most of empirical literature has focused on the global northern countries, with bottom-up transition governance structure. In this paper, we study attitudes towards photovoltaics in Iran, as a fossil fuel-rich country of the global south, with a top-down energy transition structure and committed to UNFCCC. We focused on governmental organisations as a key stakeholder group regarding their role in winning public acceptance. Aiming at finding determinants of attitudes towards PV, we conducted 15 qualitative interviews in 10 governmental organisations in Golestan, Guilan and Tehran. Taking an inductive approach to the data, we considered the acceptance and attitude theories as sensitising concepts to investigate common and specific issues in terms of social acceptance in Iran. We find accessing electricity and diversifying electricity resources via PV as the key technical drivers, and the upstream policies as the key political drivers towards PV adoption. Though the weak policies (design and implementation), privileging economic and technical obstacles, do hinder the PV adoption and shape negative attitudes toward it. We realise that the previous literature overlooked the fossil fuel-rich countries and their energy transition governance structure. Our findings imply that better-designed upstream policies with a more enabling policy framework are needed to motivate actions on the governmental organisation level.

Keywords: social acceptance; attitudes; solar photovoltaics; fossil fuel-rich countries; Iran; governmental organisations

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1. Introduction

Social acceptance as a non-separable part of renewable energy (RE) technologies development has received high attention in the academic literature during the last decades. That originates from the paradox between the agreement on climate change tackling importance via RE generation, and the public opposition to RE technologies installation (labelled as NIMBY (Not In My Backyard). The main cornerstone of social acceptance was constructed by Wüstenhagen et al. in 2007, which is addressed as the triangle of social acceptance of RE innovation and contains three interlinked dimensions of socio-political, market, and community acceptance. The existing literature in this field with the objective to overcome barriers and foster social acceptance does ask of the drivers for and barriers to RE acceptance.

Investigating the influential factors on RE technology acceptance, Billanes et al. after an extensive literature review employing academic databases between 2011–2020, stated knowledge and awareness, policy, social influence, demographics, self-efficacy, trust, enjoyment, perceived risk and compatibility [1]. Focusing on social and market acceptance, Penaloza et al. conducted a literature review and a survey of European stakeholders. They addressed investment cost as a barrier to adoption in all countries, while limited technical information, socio-demographic factors, legal and organisational issues, trust, and business models are reported as barriers only in some countries and stakeholder groups [2]. Another literature review across Europe, with 25 case studies, containing qualitative and quantitative analyses to understand drivers and barriers to social acceptance of RE with the main focus on biogas and wind energy, listed the prominent drivers as trust, distributional justice, siting issues, and socio-demographic factors [3]. To make sense of the barriers to RE technologies in India, Luthra et al. conducted an vast literature review. Twenty-eight barriers categorised into seven dimensions were revealed: financial, market, knowledge and awareness, technical, ecological, geographical, cultural and behavioural, political and government issues [4]. Karakaya et al. conducted an extensive systematic literature review based on the Web of Science database, that included the low- to high-income countries/economies and the European to Global Southern countries with the aim to understand barriers to PV adoption. They concluded the sociotechnical, management, economic and policy dimensions to be the prioritized obstacles [5].

To examine social acceptance, understanding public opinions, attitudes, or determinants of attitudes has also been increasingly recognised to play a crucial role to advance energy transition. Utilizing phrases such as "acceptance", "rejection", "support" or "apathy", and "participation" in the literature to explain attitudes is a sign of this orientation [6]. Investigating the role of attitudes in energy transition, and/or addressing the main factors affecting attitudes or social acceptance, have been the main objectives in this field. A case study in Greece was performed by Tsantopoulos et al. to investigate public attitudes towards PV in which the environmental, financial, and social factors were identified as contributing issues [7]. Another survey analysis, to understand the attitudes towards wind, biomass and waste to energy in Belgium highlighted the place attachment and personal experiences as predictors of their attitude towards RE technology [8]. Based on an online survey conducted in Germany by Gamel et al. to find factors influencing attitudes towards investment in RE, they revealed people's social norms, their confidence in NGOs, and evaluation of the relevant regulatory framework as the most significant factors [9]. With the same objective, Karasmanaki et al. studied the environmental students in northern Greece and reported environmental values, low risk, and profitability of RE investment plus preferences to some specific types of RE as the main determinants of attitudes [10]. Yazdanpanah et al., contributing to close the gap of social acceptance of RE in Iran energy transition governance, taking a socio-psychological aspect, tested the theory of planned behaviour (TPB) via a survey. They addressed attitude, moral norms, and perceived behavioural control as influencing factors on public acceptance for RE [11]. With a more psychological contribution, Bögel et al. conducted a case study on hydrogen fuel cells in Europe to investigate the role of attitudes in socio-technical transition. The low strength and stability of attitudes at the early stage of hydrogen technology in their outcomes implied that more context-specific and further empirical testing are required [12].

To address motivators and barriers to solar electricity adoption, Chelsea Schelly conducted a case study of early adopters in Wisconsin. Examining the relative importance of some factors, she concluded that environmental factors do not necessarily motivate towards adoption for the economic payback period [13]. Komendantova conducted a meta-analysis of behavioural drivers of energy transition, including factors of public acceptance and engagement in energy transition in three European countries and three countries of the MENA region. They reported the dominance of economic rationality over environmental protection, as well as a high level of awareness about the need of climate change mitigation across all studied countries [14].

In terms of methodology, surveys and quantitative approaches to data gathering and analysis have been the most frequent designs in the existing literature. The quantitative methods considering the studied group, as a more homogenous whole, lack the in-depth investigation of people's attitudes. Another considerable share of literature is dedicated to scholars who apply and test the existing theories in acceptance, adoption, and diffusion of innovation [15,16], such as planned behaviour theory (PBT) [16–18], or pro-environmental behaviours, and value–belief–norm theory [19,20]. In another categorisation, psychological or socio-psychological aspects on socio-technical transition [9,11,21–23] are the two main viewpoints, one as a more individual and the latter as a more social approach, but both psychological attitudes regard acceptance or adoption as a behaviour. The main concern in the behavioural investigations have been to gain clues that can predict the behaviour of people (here defined as adopting RE technologies).

Reviewing the theoretical and empirical literature in social acceptance of RE technology, we conclude it in some main points:

- First, not only the theoretical framework of social acceptance, but also, most empirical studies belong to the global north. Hence, a bottom-up transition governance structure is assumed in the introduction of the concept and investigating the effective factors therein.
- Second, the shared governance structure, does put the focus on the last consumer group (public society) regarding their key role in a bottom-up transition structure.
- Third, the global northern geographies have minor (if any) assets of fossil fuels, that in turn, makes acceptance and adoption of RE of less complexity (if not simpler).
- Fourth, but still of prior importance, and as our theoretical contribution: the social acceptance framework assumes "acceptance" mainly as an unconditional positive issue benefitting climate change mitigation. This is assumed independent of geography, let alone by "what" RE and "how" [6].

The combination of mentioned items (in short: not-context-specific nature of social acceptance studies) makes the existing literature of minor application in the global south, specifically fossil fuel-rich developing countries (FFRDCs) with diverse energy transition governance structures. To give applicable guidelines to policy makers, and to help in RE technology development, a consensus understanding of the specific contextual factors is necessary. Contributing to close the gap, in this article, we study the social acceptance of photovoltaics (PV) in Iran, as an FFRDC, with a centrally planned economy [24,25] committed to UNFCCC, via a study of attitudes. Our focus group consists of governmental organisations as a key stakeholder group, and a share of PV market (acceptance) in the holistic model of social acceptance according to Wüstenhagen (2007) [26] and Patrick Devine-Wright (2017) [27]. In this article, we are interested to understand which determinants drive and hold back PV adoption among governmental institutions. This is mainly an appealing question, as Iran is known as a FFRDC with 97% fossil fuel in its primary energy consumption (Figure 1).

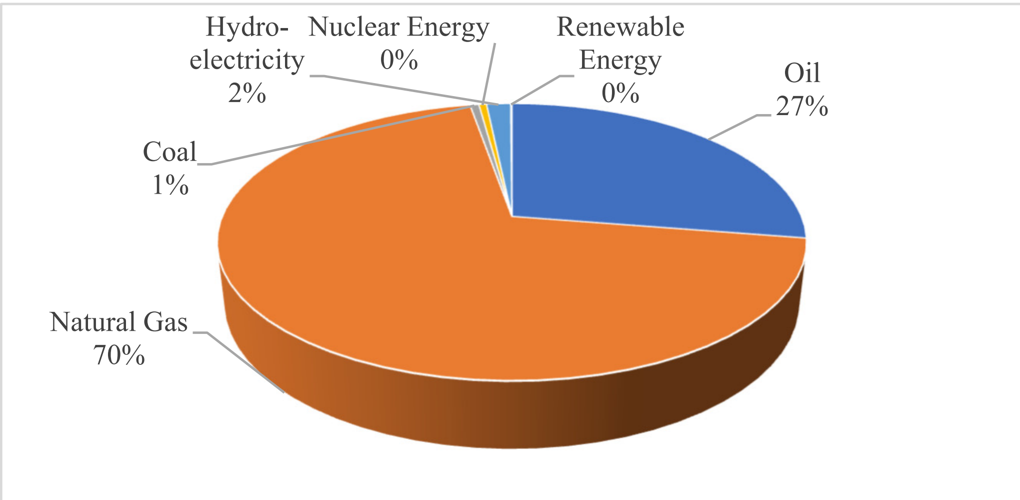

Figure 1. Iran primary energy consumption, BP 2021.

Iran as a Middle Eastern country is vulnerable to extreme climate change effects and is expected to suffer greatly [28,29]. As a FFRDC, a major contribution to fossil fuel subsidies (about 4.7% of its GDP based on IEA in 2020) [30,31] has resulted in low energy efficiency and high energy intensity [31]. Consequently, diversifying the energy mix, reducing the reliance on fossil fuels through investment in renewable energy (RE), and at the same time meeting the greedy energy demands [31,32] are big challenges for Iran. Besides the abundance of carbon-intensive energy resources, Iran benefits from huge RE potential, especially solar and wind energy [33]. Figure 2 shows the solar photovoltaic potential in Iran vs. Germany (as a scale).

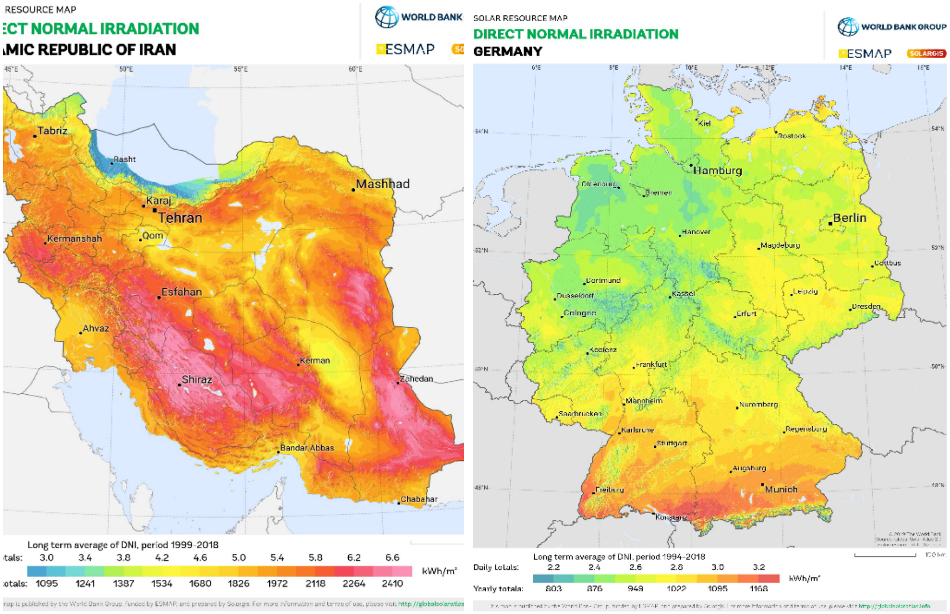

Figure 2. Solar PV potential in Iran (vs. Germany)—Global Solar Atlas 2022.

Despite being sun-kissed, the uptake of solar energy in Iran has remained very gradual, as Figure 3 shows the solar energy capacity between 2014–2021 based on IRENA 2022.

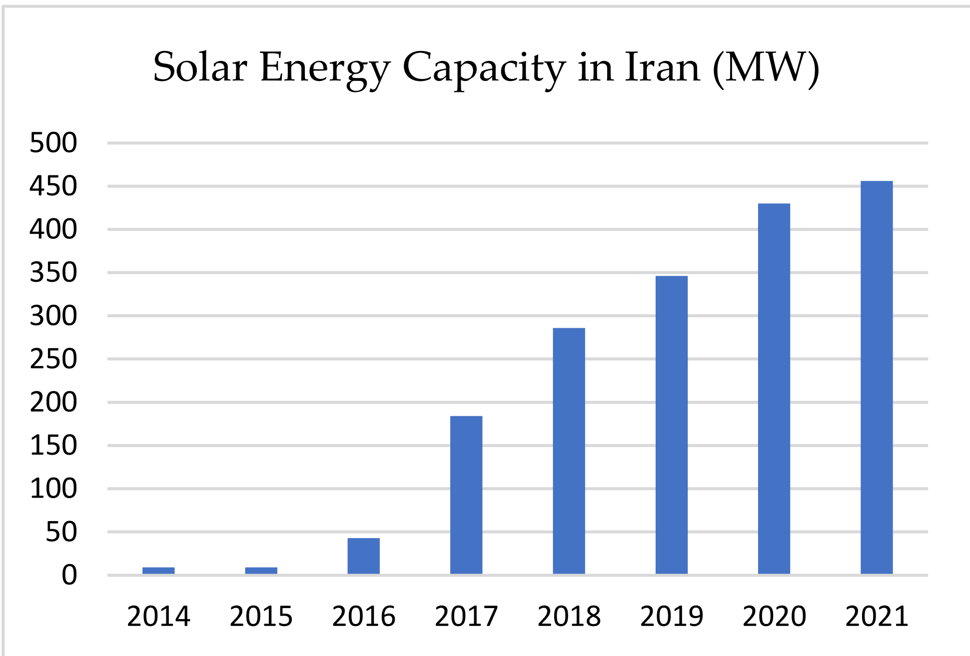

Figure 3. Solar energy capacity in Iran 2014–2021 (IRENA 2022).

(Rooftop) solar PV, as the most feasible type of RE, and as a not-fully political technology neither in existence nor its features (like nuclear energy) provides the possibility of social participation as stakeholders. In this position, gaining a consensus knowledge of drivers towards and barriers to PV adoption can provide beneficial input for the policymakers to accelerate the energy transition. Throwing light on the most neglected aspect of energy transition in Iran—social—and to find the determinants of attitudes towards PV adoption, we conducted 15 qualitative interviews in 10 different governmental organisations. The current research will be the first with an emphasis on the governmental institutions considering their key role in winning public acceptance in a country with a mainly state-owned economic system. This is a local case study, and further case studies should continue to gain better clues of acceptance and attitude factors towards RE technologies in Iran.

The rest of the article is structured as follows: Section 2 provides the research design and methods applied to fulfil the objective. In Section 3, we present the findings of our data analysis. Section 4 is specified to discussing the most innovative findings compared with other existing literature in the field, and Section 5 provides a conclusion of the paper.

2. Materials and Methods

To empirically reveal determinants of attitudes towards PV adoption among governmental organisations, we conducted qualitative research based on 15 semi-structured in-depth interviews. A qualitative interview method enabled us to retrieve information about interviewees' perception of PV technology and to gain a reflexive assessment of how and why a positive or negative attitude towards PV exists. We conducted interviews in the northern provinces of Iran, Golestan and Guilan (Figure 4), except for one with Renewable Energy and Energy Efficiency Organisation of Iran (SATBA) which is in Tehran. Golestan and Guilan, as the two northern provinces in Iran, regarding their location near the Caspian See, are green and covered with forests, although both provinces still benefit from solar irradiation of 1200–1500 KWh/m^2 average annually according to the World Bank Group measurement in the 1999–2018 period [34].

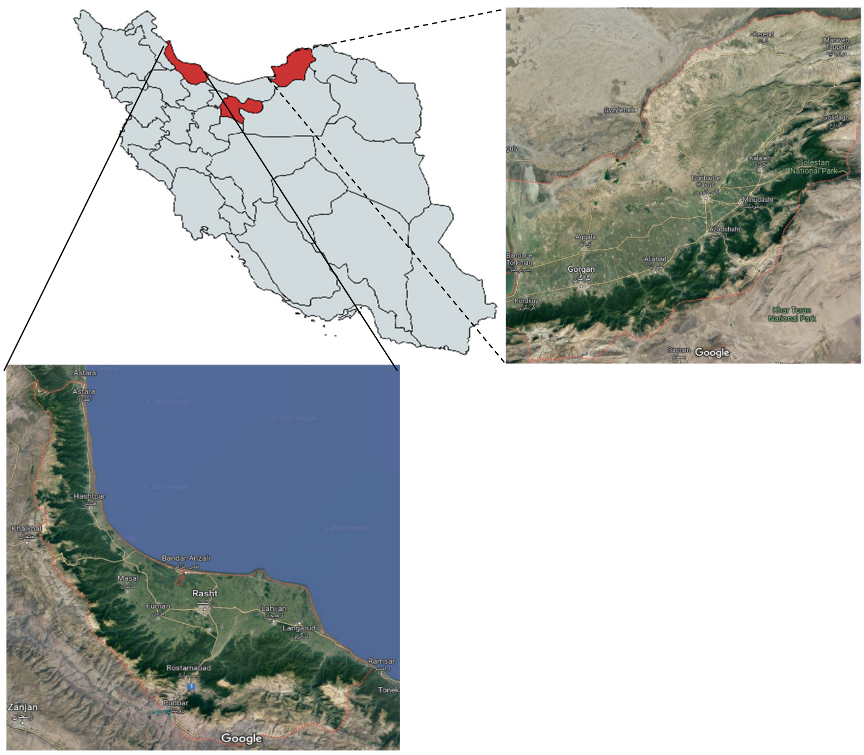

Figure 4. Local case study provinces in Iran (Golestan and Guilan).

The first and main round interviews were conducted during July and August 2021, and in specific cases, the second round of interviews (online) was conducted between September 2021 and February 2022. We tried to cover a considerable diversity of organisations in the sense of (i) their PV adoption status: previously adopted, potential adopters, and not-yet-adopted organisations; (ii) their mission, strategies, and policies. Besides the inclusive obligations on all 10 interviewed organisations based on the 2016 and 2019 issued statutory laws (explained previously in the Introduction), 3 organisations are in close connection with the Ministry of Energy (MoE) and SATBA as the central energy governors in Iran, and they are in charge of electrification. We address them as "MoE organisations". Three organisations contributed to installing PV for their members or help receivers, either to provide income via FiTs for on-grid PV (charity-based organisations), or to improve the basic socio-economic infrastructures (mainly access to basic lighting/electricity) in the case of nomads. One organisation was of higher authority level over the rest (state governor) in the province. One was SATBA as the organisation for renewable energy and energy efficiency in Iran. The other two oversaw providing water and gas (as the biggest share of energy profile in Iran). Iran has a centrally managed economic system [25], in which state-owned enterprises (addressed as governmental organisations in this research) are the main role-players in strategic and infrastructural industries, such as electricity, oil and gas, telecommunications, and so on. Hence, the electricity sector in Iran is not liberalised such as in Germany for example. According to the Iran budget law in 2021, about 70% of the total fiscal budget was allocated to 392 state-owned enterprises [35]

The interviewees differed in terms of gender and education levels (bachelor to PhD). The interviews were guided by a semi-structured interview guide. The semi-structured questionnaire was developed, confirmed, and revised after five pilot interviews. We started our interviews with more open questions, to set the scene by asking: "How do you evaluate the PV development situation in Iran regarding the existing policies and the social situation?" In the second part, we narrowed down and focused on attitudes towards PV adoption by asking: "Which actions have you taken towards PV installation in your organisation, and why? Which drivers and barriers do exist?" Asking questions about the perceptions of solar PV as a RE technology, and factors shaping those perceptions, we tried to understand for which reasons they have positive or negative attitudes towards PV adoption. Moreover, part of the answers was around the existing policies (containing upstream policies on solar PV installation in governmental organisations). Here, we gained knowledge on the functionality of the implied policies regarding solar PV.

To distinguish between what the interviewees mentioned as their own vision towards PV development status, and their own perception of (attitude towards) PV adoption, we asked questions repeatedly but with diverse wording. For example:

- Interviewee: *It doesn't exist suitable and efficient policies to support PV development in Iran.*
- Interviewer: *You mean the non-efficient policies have inhibited your organisations of installing PV? How come?*

Or:

- Interviewee: *The social awareness is too low.*
- Interviewer: *and how does it affect your action towards PV adoption?*

In this way, we tried to refer to the main axial point and help reduce the bias. Furthermore, frequent paraphrasing of what the interviewees said to ensure what they were referring to helped to fix some challenges.

The interviews were conducted and transcribed in Persian. The finalized transcripts were coded in ATLAS.ti (version 22.0.11.0) in English and analysed in a first round according to the requirements of Grounded Theory [36,37]. This approach was selected intentionally to emphasise developing analytical categories from the data inductively and to avoid testing (or applying) the theoretical frameworks and preconceptions raised mainly in Western countries (global north), which are not tailor fit to the specific context of Iran. Analysing the data and well as going through open, axial, and selective coding, central themes or topics emerged, and the text segments were grouped under corresponding headings. Open coding of interview transcriptions resulted in the identification of the attitude determinants, under 8 empirical categories. At this step, the determinants are also grouped into positive and negative, i.e., shaping attitudes towards adoption or rejection of PV. In the following section, we first introduce the empirical categories of determinants and then we delve into each one to investigate how these determinants shape attitudes towards PV adoption among the governmental organisations.

3. Results

We find eight main analytical categories containing 35 factors shaping attitudes of governmental organisations towards adoption or rejection of PV in Iran: economic, technical, social, political, organisational, ecological, geographical, and geopolitical (Table 1).

Table 1. Categories of attitude determinants based on 15 interviews in north of Iran.

8 Empirical Categories of Attitude Determinants towards PV Adoption among Governmental Organisations
Economic
Technical
Political
Social
Organisational
Geographical
Ecological
Geopolitical

It is worth mentioning that:

- Not all interviewed organisations addressed the whole eight categories in interviews.
- We present the categories in order of their magnitude (number of quotations).
- We present only the highest density (i.e., the number of links with other codes) codes. The categories are highly interlinked, containing determinants with their causes and/or effects in other categories. To avoid losing the continuity of content, we briefly mention each determinant's links with other categories.
- Economic and technical categories of determinants are directly related to PV as a technology/innovation in perception of interviewees.
- The political factors raised are mainly in pursuit of investigating the role/functionality of the upstream policies towards PV development in Iran and their effect in shaping attitudes.
- The social category contains mainly social implications of other categories (economic, technical, organisational, . . .). They reflect the governmental organisations' perception of PV development situation regarding their daily connections with households, businesses, and investors in PV. This category contains the greatest number of concepts which is proof for the priority of social aspects in developing PV technology specifically and energy transition generally, although it still has a smaller number of quotations than economic and technical factors.
- Geographic determinants shape attitudes based on case study location (northern provinces) in Iran.
- Organisational category includes factors arising from the administrative and institutional processes linked with PV project operation in Iran that shapes attitudes.
- The ecological category refers to the perceived environmental benefits of PV as a technology, although according to our interviews, they have been none of the major factors shaping attitudes.
- Sanctions by the United States have been the only geopolitical determinant which shapes negative attitudes towards PV adoption, with its direct economic and technical consequences.

Following, we delve into each category.

3.1. Economic Determinants: Hard to Afford!

"Solar PV is expensive!". This was mentioned in almost all our interviews and as the most prioritized obstacle to its adoption. The high-price perception of PV contains initial capital and periodic costs, regardless of the on/off grid system, its capacity (KW or MW), and the adopter group (households, private sector, or governmental organisations). Here, the incentivising PV deployment is considered of high significance. Based on our interviews, the high price of PV is the principal reason for delays or for its omission of the priorities in governmental organisations. The high-price perception of PV is mainly related to several external factors, referred to as macroeconomic issues in some articles [38]: (i) perceived deteriorated budget in governmental organisations; this perception does not only omit PV of the prior projects in governmental organisations, but also enforces complex and long-lasting interorganisational bureaucracies to free money for PV installation. Deteriorated budget in RE-involved organisations affects the regularity of FiTs payments which accordingly increases the perceived economic risk of investment in solar PV. (ii) The rising exchange rate is closely interlinked with the Joint Comprehensive Plan of Action (JCPOA) with an upward increment during the last years [39]. This item affects the price of PV equipment specifically because the country has not reached self-sufficiency in solar PV technology yet. (iii) Inflation has reached 52.5% in June 2022 in comparison with last year based on the Plan and Budget Organisation of Iran. According to our interviews, the rapid growth of inflation has left minor intentions of adoption among the potential adopters. Furthermore, the inflation and rising exchange rate make the specified governmental incentives to PV (to households) ineffective (uncompetitive with the continuously growing prices). We understand that inflation has loosened follow-ups/evaluations (related to PV installation) from higher authorities, and in the current situation, when no control over the prices and no evaluation exist, they have created the impression that there is no real ambition to expand PV technology from the central (top) energy governance side.

Despite the whole negatively shaping economic determinants, only in one case is PV linked with reasonable-price perception. This is the off-grid solar system to access electricity in remote areas. In hardly accessible locations, accessing conventional (fossil-based) electricity via power grid installation is linked with extremely high costs. This is clearly not the cost of fossil-based electricity, which is almost free (highly subsidised), but the cost of installing power transmission lines, towers, cables, and so on. An interviewee in an electricity distribution organisation explained: *"There were 3 villages in the east of Golestan Province with no access to electricity till last year. If we wanted to install power grid, we had to invest billions tomans. Nowadays it costs 210 million tomans only the line, let alone the transformer which costs at least 100 million tomans! By installing community solar PV instead, we made a great compensation" D 1: 105*. This shows that off-grid solar PV, in remote areas where no access to the cheap fossil-based electricity exists, would be a reasonable option. Here, we can see that in the absence of highly subsidised fossil fuel, RE can appear as an economical option.

3.2. Technical Determinants: Solar PV? Yes, but Just as the Last Option!

Solar PV is positively associated with the opportunity to diversify electricity resources. This is a very recently shaped factor, following the frequent blackouts in Iran from the summer 2021 [40,41], because of a 12,000–18,000 MW power deficit [42]. We understand that PV electricity as an option, not to substitute fossil-based electricity, but adding to the power network and compensating for the lack of fossil-based electricity. This perception is a driver among the organisations (especially MoE- organisations) to consider solar PV as a more serious option. Some interviews mentioned in this regard: *"During the nerve-racking blackouts in this summer (2021) in many provinces including here (Guilan), we are thinking if solar electricity could be a secure back-up with respect to adequate sunshine? Though a steady-state power plant is what we need, specially for large industrial units and this may omit solar panels at least in that case" D2: 38.* This shows that this recent experience of electricity outages has gained attention and has shaped positive attitudes towards PV (again in the absence of fossil-based electricity). However, PV is perceived as a non-steady/weak power resource that makes it a suspicious back up. We understand that PV is addressed as a means for simple and limited lighting or charging cell phones and low-level voltage uptake. The intermittent perception of RE electricity generation was also investigated in 2009 by Sovacool [43], although this insight in our study is due to two main reasons: (i) low capacity of solar PV system, which is a consequence of economic limitations (explained in Section 3.1), i.e., adopters of PV have to settle for low capacities (to some 5–10 KW capacity), which in turn affects their perception of its application; (ii) the Gaussian diagram of power vs. time of the output electricity of a PV system. The dependence of a PV system on the solar irradiation during the day, increasing with sunrise, reaching its maximum at noon, and decreasing by sunset, produces the perception of a non-stable source of electricity. According to our interviews, this perception sometimes omits solar PV as a back-up power in organisations compared with a standby diesel generator (with a linear and stable output power). Moreover, confirming the findings of Sovacool 2009, we understand that this attitude is shaped compared with the conventional (fossil-based) electricity system.

We address PV system standards as another meaningful determinant shaping mainly negative attitudes among our interviewees. Regarding the currently accessible equipment in Iran, in sense of quality, lifetime, after-sales services, and the fact that Iran has not yet reached self-sufficiency in this technology, the majority of PV equipment is imported. The imported equipment (due to the restrictions caused by the sanctions) are not necessarily of good quality. Moreover, a satisfiable quality, is not easily affordable. Given the economic limitations discussed before, the accessibility to high standard equipment with a reasonable price would be extremely hard, and it ruins attitudes towards PV adoption. Although there are some domestic producers of solar panels that offer after-sales guarantee, we did not reach a consensus regarding the acceptable quality of existing products. We find sanctions very limiting in this sense by restricting Iran's access to technology, service, and know-how, as other studies have also investigated [44,45].

We find the regular maintenance as a negatively perceived feature of PV. According to our interviews, regular maintenance even if containing only periodic cleaning of the solar panels' surface, or changing the inverter or batteries in case of need, has two dimensions: technical and economic (previously mentioned under periodic costs of PV). We understand that both economic and technical aspects of regular maintenance, result in low-usefulness perception of PV adoption.

3.3. Political Determinants: Yet to Be Strengthened!

We find FiTs for solar electricity as motivating policy tools towards PV adoption. We understand that the monthly paid FiTs has shaped a *"Secure source of income"* out of PV to charity-based organisations. These organisations have a considerable share of installed PV capacity in Iran [46], with their main policy, poverty alleviation, is motivated to install PV for their members. Coupling RE with income generation activities had been counted as a success factor in the Sovacool study in the Asia-Pacific [47]. To provide a regular income based on FiTs, these organisations try to overcome the economic obstacle (initial capital), via synergies with other organisations or via arranging governmental incentives.

We understand that the upstream policies on governmental organisations are the first and foremost drivers towards PV installation in these institutions. This means that in the absence of upstream policies, there would have been minor (if any) attention/tendency towards PV among governmental organisations. They are green management and 20% share of RE electricity. In 2016, the council of ministers approved the proposal of the Ministry of Energy (MoE) and obliged ministries, government institutions and non-governmental public institutions to provide at least 20% of their electricity consumption within two years via RE resources (PV as the most feasible). Based on this approval, any agency that did not apply the decree by 22 September 2017 would have to pay a higher expensive bill for 20% of their electricity consumption, although this fine has not been enforced. This statutory act was followed by "Green Management" (2 October 2019), which is under the Law of the 6th Development Plan of the Islamic Republic of Iran. Green management manages energy consumption, water, raw materials, equipment and paper, reduction of waste materials and recycling in buildings and vehicles in all executive bodies and public non-governmental organisations and institutions within the framework of relevant laws [48]. According to this regulation, the executive bodies were allowed to spend 1% of their credit line to achieve green management, of which the energy sector accounts for 30%. This funding scheme could support the finance of rooftop solar PV in government offices and institutions.

Moreover, we understand that the upstream policies supporting the PV development, despite having no effect on shaping attitudes towards PV as a technology, are effective in shaping attitudes towards PV adoption (as a behaviour [49]). In this sense, we find some gaps in the upstream policies that have resulted in incomplete implementation of them. Finance is a vital issue in each project, and we understand that it is left with insufficient attention in policies on PV projects in governmental organisations. Specifying little (if any) budget to PV installation in an upstream policy result in a perception of *"An obligation to invest!"* since the governmental organisations need to invest from their organisational budget. This becomes more significant regarding the perceived deteriorated budget among the governmental organisations (explained in Section 3.1).

In addition, some implied conflicts in policies lead to their inefficiency. Based on our interviews, an obligation on diesel generator provision (based on a decree in 2019 targeting governmental organisations [50]) is perceived as a clear conflict with green management or 20% share of electricity via PV, as RE-related obligations. To empower governmental organisations to provide service to their costumers even in electricity outages and critical situations, they were obliged to equip their institutions with diesel generators (which work with diesel/gasoline). Another case of perceived conflict in policies, of which we find, is highly subsidised (fossil-based) electricity, which is one of the highest subsidised energy resources in Iran [30,38,51–53]. According to our interviews, this is perceived as an obvious political conflict with PV (as a RE) developing policies. The FiTs for solar electricity, despite being motivating, are not competitive with the subsidies specified for fossil-based electricity. As a result, we face PV adoption where there is no trace of fossil-based electricity. An interviewee explained: *"As long as we have access to cheap energy carriers, it is hard to believe that transition to RE is something serious! That seems like a joke, do you go for solar PV, when you have access to cheap and efficient conventional electricity in Iran? D1: 45"*. We understand that any perception of conflict in the notified policies, particularly in no high-trust situations/society [54], does not help in the evasion of policies, and it certainly does not motivate their fulfilment.

We find the policies implementation evaluation as a weakness. According to our interviews, after notification of the upstream policies on PV installation, no serious examination of the activities, outputs, or feedbacks on barriers and facilitators of implementation was taken. An interviewee referring to the absence of observation on the implied obligation said: *"We have an unfinished solar PV project on our building warehouse. We should take a more serious look over that. Although nobody of our top authorities would ask and follow up what we have done regarding the PV law . . . " D1: 177*. This shows that absence of observation demotivates the governmental organisations of their satisfaction. Moreover, we understand that this defect evaluation spoils the trust among the organisations (will be explained in Section 3.4). According to some of our interviews, no serious evaluation of policies by the government is perceived as no clear political vision in the field of RE (specifically PV) as well as a lack of political commitment.

3.4. Social Determinants: A New Dilemma?

Influencing the public society and creating awareness via PV installation is a motivation, especially among the MoE organisations. Governmental organisations mentioned their motivation to be role models for individuals and institutions, via raising the visibility as a characteristic of innovation [55]. Furthermore, we find the inspirations of Western countries as a positive determinant. Western countries, especially those better developed in RE, with widespread PV installation, seem to have left a positive image in our interviewees' minds. This was mentioned frequently by interviewees, with an experience of short/long stays abroad. The positive inspiration was not only limited to PV installation, but also to energy consumption behaviour, especially electricity, gas, water, and heating homes, resources that are treated in a completely different way than in the motherland.

We find streaks of resistance against PV but different from the Western syndrome: NIMBY selfishness [56] but maybe with ignorance [57]. The interviewees mentioned a kind of social resistance in some groups of households against PV, which is demotivating. This resistance based on our study has diverse causes: (i) Low-level knowledge of PV as a technology/innovation [55,58]. This was mentioned among the nomads who spend dark nights in deserts without any access to lighting but who still resist against an unknown technology: off-grid PV. In this case, creating awareness among them is accompanied with a lot of effort by the involved organisation (here, the nomadic organisation). (ii) Perceived technical deficiencies. We understand that an existing knowledge of PV containing its economic and technical characteristics results in no persuasion [55] or resistance. In this case, the households resist against the electrifying-involved organisations conducting community or individual PV projects in remote villages.

PV as a means of access to electricity in remote areas, meeting a basic social need and raising standards of living [47] shapes positive attitude among the involved organisations, although this may not be the case among households (adopters), and in some situations, it is accepted only as a last option. This calls for specific research focusing on the households to directly investigate their attitude towards solar PV. Regarding the resistance of villagers against electricity distribution organisations, an interviewee explained: *"We faced serious opposition in three projects of electrifying villages, that made us to cancel them. Those villagers who are in close communication with city dwellers (urban people), having a basic familiarity with the urban (fossil-based) electricity did not accept PV. They think with urban electricity, that provides satisfying level of power and stability, they can use the energy-hungry home appliances, or even their welding machine to do business, while with PV they should degrade their expectations to some low-consumption light bulbs, a simple TV, and a 9 Cu. Ft. refrigerator! Let alone the cheap, if not free price of urban electricity. They wanted an access to electricity, but not an any quality!" D2: 22*. This shows that even if meeting the basic needs, PV may not always be the desirable option, but just better than nothing! Here again, the footprint of adequate fossil fuels spoils the desirability of PV.

Besides the resistance against PV in some cases, we understand that the interviewees face an apathy or reluctance towards PV, in their daily connections with households or investors. As partial reasons for this reluctance, we find: (i) Limited communications channels and minor (if any) activity of media in the field of RE and climate concerns. They have created a low level of awareness among the public society not only on the technical aspects of PV, but also on the specified FiTs. The interviewees address a satisfying level of public awareness exclusively to either highly/related educated people in this field or to professionally engaged people in this field and to a small circle of acquaintances around them. A CEO in electricity distribution organisation stated about some successful cases of PV adopters in the province: *"In our province, the first user who installed solar PV at his home, was a retired employee of our organisation. He had enough information regarding his experience in this field" D1: 130*. He continued about a second case, referring to his siblings as solar PV adopters in Gorgan (capital city of Golestan), saying: *"My brother and sisters who live in the same block of apartments, have reached an agreement and installed solar PV over the roof of their building and they have a regular income based on monthly FiTs" D1: 270*. Both typical cases reveal the limited channels of awareness of PV, as professional experience/exposure, and to the limited circle around them. (ii) Economic limitations. We understand that the high price perception of PV, strengthened with inflation, and/or rising exchange rate, leads to longer periods of investment return rates, which in turn create (or worsen) the perceived economic risk and results into reluctance among investors. (iii) The low technical potential and complex land acquisition process in the north of Iran. We understand that both geographic determinants (will be explained more in Section 3.6) leave reluctant investors to utility-scale PVs, which shape negative attitudes among our interviewees, accordingly.

Low-level trust among the governmental organisations is an influencing issue in shaping attitudes towards PV adoption. Based on our interviews, a considerable share of distrust among the organisations is an implication of no serious observation/evaluation (as discussed in 3.3 political category) by the top energy governors. An interviewee stated: *"The X organisation asserts that it implied the 20% RE law, I cannot believe it myself. You should go personally and verify his claim. Sometimes they just spend a lot of money and take budget for this project, but in practice when you want to observe it, they make frequent excuses: today we cannot show it, this person is absent, tomorrow that is not working, the day after, ... today the weather is not good, and so on and so forth. Finally, you understand no efficient and logical project is conducted. It is only a lie! They just claim it to upgrade their rankings. In reality it is only waste of money and resources" D1: 72.* This quotation clarifies that the interviewees (organisations) do not necessarily believe their peers' claims and actions (in this case, for PV installation). This reveals a gap in the upstream policies (as explained in Section 3.3.) and its effect on social parameters.

3.5. Organisational Determinants: Thinking like Small Islands!

We understand that the routine process—linked with almost no bureaucratic complexities—shapes positive attitudes towards adopting PV. This is mainly the case in accessing electricity in remote areas and compared with the conventional inter/intra-organisational processes to access fossil-based electricity. An interviewee explaining the bureaucratic advantages of PV in comparison with power-grid installation said: *"To electrify remote areas, you are now obliged to fix the transmission towers only on the road route and to do that you should go through a long, complex, and time-consuming organisational bureaucracy. You need to take allowances of X, Y, and Z organisations, whether they consent or not! Sure, in this case off-grid PV will be a win" D1: 39.* The long-lasting and complex paperwork between different organisations to obtain the necessary permits for installing electricity transmission towers and power lines to access fossil-based electricity motivates the involved organisations towards off-grid PV.

Opposite to the installation of PV in households, which is associated with minimal bureaucratic processes, we understand that installing PV in governmental organisations is linked with complexities. The interviewees mentioned the long and tiring organisational process of freeing money for PV projects as a demotivating issue. We address the perceived budget deterioration (mentioned in Section 3.1) as a reason for this bureaucratic complexity. The perceived financial limitations make organisations act more carefully when financing projects, although it is not always budget limitation that omits PV from the priority list.

We find island thinking among organisations, with diverse implications/consequences: (i) paying minor attention to PV, as a technology to access electricity, with an environmentally friendly nature; (ii) resistance against solar PV adoption when it comes to fossil-based (e.g., gas, and oil-involved) organisations as the dominant providers of energy in a fossil-fuel-rich country such as Iran; following such an approach, we understand that the MoE, or environmental organisations, are under the microscope regarding their reaction/fulfilment of solar PV-related obligations; any positive or negative reaction of them would be exaggeratedly perceived by other organisations, which gives them a key-role against the non-MoE/environmental organisations; (iii) Less (if any) environmental concerns, some organisations who see PV not in line with (if not against) their organisations central policies; we realise that that mindset is even reflected in their environmental attitudes towards PV. When we asked organisations whether they have any ecological attitudes linked with solar PV, they said: *"This should not be any of our concerns! We are responsible for X, Y, and Z. Environmental concerns should be a priority of Environment organisation, the same with electrifying* via *solar PV that must be a concern of MoE- organisations" D1: 78.* This shows that the governmental organisations preferably think as island-like, instead of systematic, even about climate concerns as a global concern.

3.6. Geographical Determinants: Greed of Technical Potential!

We find land use as an environmental impact of solar PV (utility-scale/MW size) shaping negative attitude towards this technology, in natural resource-rich regions, such as the north of Iran. Regarding this factor, the interviewees mentioned their suggestions on floating solar PVs over water dams, which reduce not only the land use, but help against surface water evaporation in hot summers. Regarding the considerable number of water dams in the northern provinces, and adding to water scarcity in Iran, floating solar PV can be a helpful strategy not only to prevent surface water evaporation, but also to increase the electricity generation capacity.

In addition to land use as a geographic-dependent issue, as mentioned before, we find the land acquisition process as another negative determinant of attitudes. We understand that, notably, northern provinces of Iran, with rich natural resources and cultivable land, force a complex land acquisition bureaucracy for utility-scale solar power plants. We understand that this complex land acquisition process makes it challenging for electricity-involved organisations to absorb investors in utility-scale PV in the north of Iran. An interviewee referring to complex land procurement bureaucracies in Golestan explained: *"One of the biggest obstacles for building MW-size solar farm in north of Iran having greener lands, is the complex bureaucracy we face here. For lands larger than 10 Hectares, a confirmation by the minister is needed. While in Semnan, Yazd, … (central cities in desert areas) it is not the case. In Semnan one could easily build solar farm in a 20–30 Hectares land since the value of land is considerably low there, with the least natural resources and no fertile soil" D1: 114.* This shows that the northern regions of Iran are perceived of as considerable complex bureaucracies in comparison with the central regions. The north of Iran, with arable and cultivable lands, is economically and organisationally of lower interest to investors and to the involved organisations.

Besides the complex land acquisition process, we find technical potential as another negatively shaping geographical determinant. According to our interviews, the northern regions of Iran are perceived as less solar irradiation benefitted and accordingly as lower technical potential (in comparison with the central regions of the country), which is less attractive for investors in solar PV. We understand that lower technical potential has implications on investment return rate that increases the perceived economic risk of solar power plant construction for investors, leaving reluctancy to invest in the north.

3.7. Ecological Determinants: None of the Immediate Concerns!

Opposite of the utility scale solar power plants for which land use is perceived as a disadvantage, off-grid PV (individual or community-scale) is perceived as a means of electrifying remote areas and is linked with the minimum (if any) natural resources destruction. This positive attitude is shaped mainly in comparison with accessing conventional electricity via installing power transmission lines, which is associated with deforestation and destructing natural resources in the north of Iran. We understand that this ecological determinant adds to other advantages of accessing electricity via off-grid solar PV (economic, technical, social, organisational) in the perception of our interviewees.

3.8. Geopolitical Determinants: The Irony of Policies!

We find the imposed sanctions by the US against Iran as the last but not least factor influencing attitudes towards PV as a technology, including its development. According to our interviews, sanctions have significant effects on the rising exchange rates and inflation (both mentioned under the economic category). Moreover, sanctions reduce the access to PV technology and know-how that affects the perceived solar system standards (mentioned in Section 3.2). Hence, sanctions with negative economic and technical implications affect attitudes and social acceptance for solar PV. Despite some domestic companies in Iran producing or assembling solar panels [59], inverters and batteries, the country has not yet reached self-sufficiency in this technology. We understand that the indirect limitations imposed by the sanction considerably slow down the development of solar PV in Iran.

4. Discussion

Drawing on a grounded theory approach (Corbin and Strauss, 2015) and based on the empirical research conducted in Golestan, Guilan, and Tehran, we investigated attitudes towards solar PV adoption among governmental organisations. The significant role of local governmental institutions has been addressed frequently in accelerating RE development [60–62]. By conducting qualitative interviews, we find eight main empirical categories of attitude determinants such as: (1) economic, (2) technical, (3) political, (4) social, (5) organisational, (6) geographical, (7) ecological, and (8) geopolitical. The categories are highly interlinked; under each category, we find different determinants that shape attitudes either positively or negatively. Specifically accessing electricity via solar PV shapes attitudes positively because governmental organisations associate that with financial, bureaucratic, and ecological advantages. In addition, diversifying electricity resources via solar PV is a recent and very relevant issue that shapes positive attitudes towards PV. This motivation is associated with recent electricity outages in Iran (summer 2021) that make governmental organisations think of alternative sources of electricity. Furthermore, PV is perceived as a high cost and low efficient technology that makes it a "not cost-effective" option, unless there is no access to fossil-based electricity. Overall, we find more factors shaping attitudes negatively than positively. In terms of functionality of the upstream policies in developing PV, we understand that they work as a primary driver, although the weak design and implementation of them has led to shaping negative attitudes. These findings are relevant, as they provide a novel understanding about the social acceptance of PV (as a RE technology) in Iran as an FFRDC of the global south. The findings of this study can be mainly used in fossil fuel-rich countries with similar energy transition systems. The results out of this study should help policymakers to design stronger and better enabling policies, prioritising social acceptance as a foremost factor in the success of any transition. Table 2 provides a detailed list of codes and their interlinking structure. Following this, we discuss the key determinants in more detail. In the following subsections, we only discuss the most innovative findings out of our study and their implications.

Table 2. Determinants of attitudes towards solar PV among governmental organisations in the north of Iran, summer 2021.

Codes No.	Categories	Concepts (+/− Shaping Attitudes)	Linking Codes
C 1.1	Economic	−Perceived cost of solar PV (initial and periodic) On-grid	C 1.2, C 1.3, C 1.4, C 2.4, C 2.5, C 4.6, C 3.5, C 8.1
C 1.2		−Perceived budget deterioration in Gov. Org.	C 1.1, C 3.2, C 3.3, C 5.2
C 1.3		−Rising exchange rate	C 1.4, C 8.1, C 4.6
C 1.4		−Inflation	C 1.1, C 4.6
C 1.5		+Perceived cost of off-grid PV to access electricity	C 2.2, C 4.1, C 5.1, C 7.1

Table 2. *Cont.*

Codes No.	Categories	Concepts (+/− Shaping Attitudes)	Linking Codes
C 2.1	Technical	+Diversifying electricity resources via PV	C 2.6
C 2.2		+Accessing electricity via PV in remote areas	C 1.5, C 2.3, C 4.1, C 5.1, C 7.1
C 2.3		−Weak/non-steady power resource (on/off-grid)	C 1.1, C 2.2, C 4.1, C 4.4
C 2.4		−Low quality PV equipment	C 1.1, C 8.1
C 2.5		−Regular maintenance of PV	C 1.1
C 2.6		−Electricity outages, lack of fossil-based electricity	C 2.1
C 2.7		+Floating solar farms	C 6.1
C 3.1	Political	+FiTs	C 4.9
C 3.2		+Upstream policies, obliging/developing PV	C 3.3, C 3.4, C 3.6
C 3.3		−Designing policy, finance	C 1.2
C 3.4		−Diesel Generator obligation	C 3.2
C 3.5		−Highly subsidised fossil-based electricity	C 3.1, C 4.6
C 3.6		−Evaluation/observation on implementation	C 3.8
C 4.1	Social	+Meeting basic needs (electricity)	C 1.5, C 2.2, C 2.3, C 5.1, C 7.1
C 4.2		+Rising awareness, influencing public	C 4.5, C 3.2
C 4.3		+Inspirations of Western Countries	
C 4.4		−Social resistance	C 2.3, C 4.5
C 4.5		−Low level awareness/knowledge	C 4.2, C 4.4, C 4.6
C 4.6		−Social apathy/reluctance	C 1.1, C 4.5, C 4.7, C 3.5, C 6.2, C 6.3
C 4.7		−Limited communication channels	C 4.6
C 4.8		−Low level trust	C 3.6
C 4.9		+Sustainable (monthly) income resource	C 3.1
C 5.1	Organisational	+No excessive bureaucracy to access electricity via off-grid PV	C 1.5, C 2.2, C 4.1, C 7.1
C 5.2		−Long bureaucracy to free money in gov. org.	C 3.2
C 5.3		−Island thinking	

Table 2. *Cont.*

C 6.1	Geographical	−Land use (MW-scale PV)	C 2.7
C 6.2		−Technical potential in North	C 4.6
C 6.3		−Complex land acquisition process	C 4.6
C 7.1	Ecological	+Electricity access via off-grid PV, no natural resources destruction	C 1.5, C 2.2, C 4.1, C 5.1
C 8.1	Geopolitical	−Sanctions, JCPOA	C1.1, C 1.3, C 2.4

4.1. The main Drivers towards PV Adoption in an Oil-Rich Country

"Solar PV? Only to electrify remote areas, where there is no access to power network" D2:3. This was common feedback to our interview questions on solar PV. Solar PV in Iran mainly/only makes sense where there is no access to conventional (fossil-based) electricity (or when it is linked with high complexities). In this situation, a small (or community)-scale off-grid solar PV system would cost far less than installing a power network, and it would contain far less (if any) organisational bureaucracy and environmental destruction. Otherwise, with previous access to fossil-based electricity, solar PV is linked with high costs and technical inefficiencies. The preference of off-grid PV to the conventional electrification methods with economic rationalities was also mentioned in a grey article by the World Bank in 2000 [63]. Blum et al. have also studied rural electrification in Indonesia and have mentioned the cost un-competitiveness of PV vs. conventional centralized electrification. Calculating the levelized cost of electricity (LCOE) of PV, they stated that the competitiveness of electrification via PV increases with remoteness of the village [64]. In addition, accessing electricity via solar PV as a driver towards it was empirically studied in research by Charles Mukuku in 2018 in East Africa [65]. The study is based on a survey and is focused on some models: Pay As You Go (PAYG), mini-grids, and fee-for-service to address affordability. A meaningful difference between East Africa and Iran is their electricity access rate. Iran, specifically from 1979 (Islamic Revolution), followed and applied an ambitious program of electrification of rural areas [66]. The electricity access rate in Iran is now about 98% in urban areas and 76% in rural areas [66,67], while in East Africa, only a 36% electricity access rate was reported in 2019 [68]. With respect to the high electricity coverage in Iran, and still introducing solar PV as a "means of electrifying remote areas" (with no electricity access), indicates the minor popularity of this technology. Afsharzade et al., in their study in 2016 [69], emphasised RE development to reach sustainable rural development regarding economic, social, and environmental advantages. Regarding the infrastructural, economic and socio-cultural obstacles, they recommended serious attention to policymaking in this field. Our findings do not have any conflict with rural development, but with respect to (i): low population and high electricity coverage in rural areas of Iran, and (ii): the high urbanisation rate in Iran, growing from 64.20% in 2000 to 74% in 2016, and rising to 75.94% in 2019, which is expected to reach 85.82% in 2050 [70]. We raise the argument that electricity access as a driver towards solar PV does not promise PV development in the long term.

Besides electricity access, we understand that diversifying electricity resources via solar PV is also shaping a positive attitude towards this technology. This is a very current technical issue referring to the frequent blackouts in Iran during summer 2021 (because of an at least 12,000 MW imbalance in electricity production and consumption in the country [42]). Based on our interviews, this makes governmental organisations think of solar PV as an alternative source of electricity, by installing them over the roofs of large industrial units [71]. Driving towards PV due to the fear of insufficient fossil-based electricity, in a "fossil fuel-rich country" specifying the highest subsidies to fossil energy resources [30,31], with high and rapidly increasing energy intensity [72,73], and low energy efficiency [31,51,72], seems more like an addition of RE on top of the energy mix, than a real transition from fossil fuel to RE. RE development as an addition to the energy mix, and not a real transition from fossil fuel to RE, was also reported by Richard York et al. in 2019 [74] based on a historical review of the diverse energy consumption on the global scale between 1800–2017. He concluded that what we need is not simply a growth of RE, but instead a replacement of fossil fuels by RE. Only in this case will we avert the climate crisis. Although the York study was on a global scale, our findings suggest that the probability of this form of RE development can be more serious in fossil fuel-rich developing countries subject to the resource curse [75]. Diversifying electricity resources via solar electricity can help power electric system resiliency and open the PV market in Iran, but parallel measures on energy efficiency and intensity are also needed for a real contribution to energy transition. In summary, our findings imply that accessing electricity and diversifying electricity resources via PV can be positive drivers that only open the PV market in Iran. For a desirable diffusion of this technology, a real transition from fossil to RE would be possible when serious measures are taken regarding energy efficiency and intensity. Although social acceptance has been mainly referred to as a success factor in climate change mitigation and RE technologies development, our findings suggest that social acceptance needs to be considered as context specific, as there may be determinants that shape positive attitudes towards a specific RE technology but that do not necessarily promise a positive step towards climate change mitigation. It is recommended that the role of attitudes and acceptance factors to be considered or investigated are context specific. Paul Upham, Paula Bögel et al. mentioned in their case study on hydrogen technology that they investigated the role of attitudes. Their emphasis was on RE development and not necessarily on the geography [12].

4.2. The Trace of Governance Structure in Social Acceptance

We understand that solar PV, despite being originally a RE technology, is approached as a partially political issue. The moderating role of policy and propaganda was also mentioned by Saqib Ali et al. in a study on PV adoption with influencing factors in Pakistan [76]. The focus had been on designing awareness programs for consumers, trainings, as well as to subsidizing and tax reliefs to attract firms to invest in PV projects. The significance of policy measures, supports, and incentives was also mentioned in other studies. Billanes et al. listed policy (defined as principles or regulations to guide decisions) as a factor influencing users' behavioural intentions toward RE technologies. They highlighted the functionality of policy as tools to raise awareness via trainings and programs, or by providing incentives to retailers and enhancing diffusion of these technologies [1]. Lack of adequate political government policies and political commitment was also mentioned by Luthra et al. from their extensive literature review with Indian perspectives [4]. Karakaya et al., in a consistent literature review, also addressed policy as an important barrier to adoption of PV [5]. Mainly subsidies, as insufficient and ineffective policy supports, have been the focus here.

A reason for the politicisation of the attitudes towards solar PV in our study can be found in the upstream policies on governmental organisations regarding PV installation. A 20% RE share in electricity consumption and green management (the upstream policies, previously explained under the political category in detail) in governmental organisations was shown as the original driver towards PV adoption in these organisations. This means that in the absence of upstream policies, PV adoption among governmental organisations would be better studied under social "apathy", than social "acceptance". This critique to social acceptance theoretical framework was also raised by Susana Batel and Patrick Devine-Wright in 2013 [77]. We conclude that in a top–down energy transition structure, in which any action towards RE adoption is expected to start from the energy government, social apathy can give better clues of the people's approaches toward these technologies. The passive role of society in centrally planned economies is stated in some studies as a consequence of high subsidisation of energy [25].

Regarding upstream policies, despite functioning as primary drivers in this study, their positive effectiveness in shaping attitudes towards PV adoption remains subject to uncertainty. We understand that conflicting policies on the one hand, and no observation on their implementation on the other hand specially in a low-trust environment (public and political [78]), does shape negative attitudes towards adopting the policy (in this case, installing PV). In addition, missing evaluations of the notified obligations is not only demotivating, but also ruins trust and results in less transparency [79,80] among the governmental organisations and national governors. We conclude that the negative political determinants privilege the negative economic and technical determinants of attitudes towards PV, and they limit the development of this technology development among the target group of study.

Politicisation of attitudes toward PV adoption and social acceptance, as a characteristic of top–down transition systems, adds to the responsibility of national governors. Government is not only in charge of designing effective policies, but also plays a meaningful role in shaping social attitudes toward PV (as a RE technology) adoption. This highlighted footprint of government in shaping social acceptance, is different with (if not opposite) the empirical studies in global northern countries with bottom–up transition governance structures. This means that the government, in a not-shared governance structure, leads not only the top–down transition (via policymaking and regulatory issues), but also affects the bottom–up participation of society. This derived implication out of our research reminds the Ulrich Beck's Theory of Risk Society, contributing to the human dimension of climate change. He states that in the face of a risk society (due to critical threats like climate change and measures regarding energy transition), the centralised state/ government, with an unquestionable rationality appears inadequate or even impotent. Instead, the political decision-making process as a process of collective action with a decentralised structure, can be understood and effect better [81,82]. Iran, as a high climate-risk country needs engagement of diverse stakeholders, as well as better strong and enabling upstream policies (more political will [83]), avoiding any reference of conflict. Focusing on governmental organisations as role models for the public society [84–87], our research suggests that the existing positive motivation among governmental institutions to influence and raise awareness among the public society can be an accelerating factor in solar PV development, specially in combination with better strong policies, issued from a more collective governance structure.

4.3. The Non-Emergency of Ecological Factors

The non-emergency of environmental aspects of PV do not refer to low awareness or ignorance of our interviewees with respect to their level of education (between bachelor and PhD) as a demographic factor. Hence, the knowledge of climate change and the environmental benefits of RE technologies is not unknown, but instead the "concern" or "obsession" regarding the ecological issues has minor effects on shaping attitudes. This minor attention to the environmental dimension of PV indicates the very low priority given to environmental concerns, in comparison with other attributes such as: economic, political, and social factors. This finding aligns with a study in Brandenburg, Germany, by Busch et al., in which they admitted that climate change or contribution to energy transition had a minor (if at all) role [85]. The dominance of economic rationality with concerns about energy prices and socio-economic impacts from energy transition over other concerns such as environmental protection was also reported by Komendantova in her meta-analysis of behavioural drivers of energy transition in six countries [14]. The socioeconomic status for Iran is measured with a high HDI (Human Development Index) of 0.783 (ranked 70 out of 189 countries [88]). The minor attention to environmental factors in our study contradicts the conclusion of Sulemana et al. in African and developed countries, which found a direct relationship between socioeconomic factors and environmental concerns [89]. Iran, as a pre-industrialised country, aligns with the Environmental Concern KUZNETS Curve (ECKC), where the environmental concern is assumed as a characteristic of developed capitalist economies [20,90]. The EKC is often used to describe the relationship between economic growth and environmental quality. It refers to the hypothesis of an inverted U-shaped relationship between economic output per capita and some measures of environmental quality. As GDP per capita rises, so does environmental degradation. However, beyond a certain point, increases in GDP per capita lead to reductions in environmental damage.

5. Conclusions

Contributing to understand social acceptance of RE in FFRDCs of the global south, we investigated attitudes towards PV among governmental organisations in Iran. We reached eight main categories of interlinking determinants of attitudes. Our provocative findings suggest that, first: positive determinants of attitudes or drivers towards PV (as a RE) adoption in a fossil fuel-rich country such as Iran may not necessarily lead to climate change mitigation, opposite to what is assumed in social acceptance concept introduction, which originated from the global northern countries. Our second provocative finding identified and underlined an important contextual factor for governmental organisation activities in a centrally governed FFRDC: without clear signs from the top, no action to support RE transition (PV adoption in this case) is taken. This indicates that in top–down transition governance systems, social "apathy" provides a better field of study than "acceptance" as public engagement in RE issues. Third, the weakly designed policies contribute to shaping negative attitudes towards PV adoption. This implies that the upstream policies in Iran with a top–down transition governance system, have considerable effects on social acceptance. This suggests that a more shared transition governance structure (instead of central one), can drive more actions towards energy transition.

We acknowledge that our study has some key limitations mainly due to financial and time limitations. Moreover, the COVID-19 pandemic restrictions forced challenges in reaching more interviewees. In a limited number of interviews, obtaining honest answers was challenging, mainly because of job position influence of the interviewees. Our local case study is a start to better understanding the social aspect of energy transition in FFRDCs, with a top–down transition governance system. Further research should investigate social perceptions in the global south, contributing to the social acceptance theory, following the holistic model by Wüstenhagen and Devine-Wright [26]. Besides investigating the interplay among three dimensions on the micro to macro levels, which can be a source of inspiring ideas, a more policy-oriented study investigating local vs. national policy makers in Iran would also provide fruitful findings.

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