Conceptualizing alternatives to contemporary renewable energy development: Community Renewable Energy Ecologies (CREE)

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Abstract

Privately-owned, state-owned and public-private renewable energy (RE) projects are increasingly criticized by social scientists. They can involve dispossessions, management and financial inequalities, and environmental problems. Research also indicates that Community Renewable Energy (CRE) projects are not without problems and dangers. In this article, I go beyond critique of renewable energy projects, without abandoning them, to develop an alternative affirmative framework for RE production in the face of mounting climate and ecological crises. I employ a productive approach to rethink RE development, that combines the diverse and community economies perspective developed by J.K. Gibson-Graham with political ecology research on alternative economies. Building on this approach and RE and CRE literature, I develop the notion of Community Renewable Energy Ecologies (CREE). CREE signify community economies involved in small-scale RE prosumption (production and consumption), or medium-scale RE prosumption and sale of energy. They adopt non- and alternative capitalist relations of ownership, production, exchange and circulation. CREE are engaged in collective ethico-political decision-making, and an *oiko*politics embodying care for and affective relations with humans and more-than-humans. Such decision-making and *oiko*politics are directed towards more 'thriving' and egalitarian socio-ecological futures. I identify particular ethico-political orientations for CREE and provide specific considerations for their constitutive elements (e.g. ownership, finance, labor, infrastructure). CREE reflect one of multiple possibilities for alternative sustainabilities in a pluriversal world.

Keywords: Renewable energy, capitalism, affect, community economies, climate change, commoning

Résumé

Les projets d'énergie renouvelable (RE), qu'ils soient privés, étatiques, publics ou public-privés, sont de plus en plus critiqués par les spécialistes des sciences sociales. Ils peuvent en effet entraîner un phénomène de dépossession, des inégalités gestionnaires ou financières, ainsi que des problèmes environnementaux. De même, la recherche montre que les projets communautaires d'énergie renouvelable (CRE) ne vont pas sans problèmes ou sans risques. Dans cet article, je vais au-delà de la critique des projets d'énergie renouvelable, sans les abandonner, pour développer un cadre alternatif pour la production d'énergie renouvelable pour faire face à la montée des crises climatiques et écologiques. J'utilise une approche alternative pour repenser le développement des énergies renouvelables, qui combine la perspective des économies communautaires développées par J.K. Gibson-Graham avec des recherches en écologie politique sur les économies alternatives. Sur la base de cette approche et sur celle de la littérature RE et CRE, je développe la notion d'écologies communautaires des énergies renouvelables (CREE). Les CREE se réfèrent à des économies communautaires impliquées dans la production, la consommation et la vente d'énergie renouvelable à petite et

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moyenne échelle. Elles se caractérisent par des relations de propriété, de production, d'échange ou de circulation non-capitalistes ou alternatives. Elles impliquent une prise de décision éthico-politique collective et une économie écologique ('*oiko*politique') incarnant le soin et les relations affectives avec les humains et les non-humains. Une telle prise de décision et cette *oiko*politique sont orientées vers des futurs socio-écologiques plus 'prometteurs' et plus égalitaires. J'identifie certaines orientations éthico-politiques pour ces écologies et j'élabore quelques idées relatives à leurs éléments constitutifs (comme la propriété, les aspects financiers, le travail et l'infrastructure). Les CREE constitutent l'une des multiples possibilités de durabilités alternatives dans un monde 'pluriversel'.

Mots clés: Énergie renouvelable, capitalisme, affect, économies communautaires, changement climatique, mise en commun

Περίληψη

Κοινωνικοί επιστήμονες αυξανόμενα κριτικάρουν τα ιδιωτικά, δημόσια και ιδιωτικά-δημόσια έργα Ανανεώσιμων Πηγών Ενέργειας (ΑΠΕ). Αυτά μπορεί πράγματι να οδηγήσουν σε αποστερήσεις, σε διαχειριστικές ή οικονομικές ανισότητες, καθώς και σε περιβαλλοντικά προβλήματα. Παρομοίως, έρευνες για τα έργα ΑΠΕ από κοινότητες δείχνουν ότι και αυτά ενέχουν προβλήματα και κινδύνους. Σε αυτό το άρθρο προχωρώ πέρα από, αλλά δεν εγκαταλείπω, τη κριτική των έργων ΑΠΕ για να διαμορφώσω ένα εναλλακτικό πλαίσιο για τη παραγωγή ανανεώσιμης ενέργειας για την αντιμετώπιση της επιταχυνόμενης κλιματικής και οικολογικής κρίσης. Υιοθετώ μια παραγωγική προσέγγιση, που συνδυάζει τη προσέγγιση των ποικιλόμορφων/κοινοτικών οικονομιών που διαμορφώθηκε από τις J.K. Gibson-Graham με έρευνες πολιτικής οικολογίας για εναλλατικές οικονομίες. Χτίζοντας πάνω σε αυτή τη προσέγγιση και σε έρευνες για τις ΑΠΕ διαμορφώνω την έννοια των Κοινοτικών Οικολογιών Ανανεώσιμης Ενέργειας. Οι Κοινοτικές Οικολογίες Ανανεώσιμης Ενέργειας (ΚΟΑΕ) ορίζονται εδώ ως κοινοτικές οικονομίες που ασχολούνται με παραγωγή, κατανάλωση και πώληση ανανεώσιμης ενέργειας σε μικρή ή μεσαία κλίμακα βάση μη-καπιταλιστικών και εναλλακτικά-καπιταλιστικών σχέσεων ιδιοκτησίας, παραγωγής, ανταλλαγής και κυκλοφορίας. Οι ΚΟΑΕ επιδίδονται σε συλλογική ηθικο-πολιτική λήψη αποφάσεων και σε μια οικοπολιτική που ενσαρκώνει τη φροντίδα για και συναισθηματικές σχέσεις με τους ανθρώπους και τη περισσότερο-από-ανθρώπινη φύση. Τέτοια λήψη αποφάσεων και οικοπολιτική στοχεύει σε πιο 'ακμάζοντα', ισόνομα και ισότιμα κοινωνικο-οικολογικά μέλλοντα. Προσδιορίζω συγκεκριμένους ηθικο-πολιτικούς προσανατολισμούς για τις ΚΟΑΕ και παρέχω συγκεκριμένες σκέψεις για τα βασικά δομικά στοιχεία αυτών (π.χ. ιδιοκτησία, εργασία, υποδομές). Οι ΚΟΑΕ είναι μια από τις πολλαπλές πιθανότητες για εναλλακτικές βιωσιμότητες σε ένα πολυσυμπαντικό κόσμο.

Λέξεις κλειδιά: ανανεώσιμη ενέργεια, καπιταλισμός, συναίσθημα ή θυμικό, κοινοτικές οικονομίες, κλιματική αλλαγή, κοινοποίηση

1. Introduction

Renewable Energy (RE) development under utility-scale and smaller state-owned, privately-owned or public-private projects is increasingly criticized by social scientists –including political ecologists– given the adverse dynamics, dispossessions and environmental problems observed in different cases (e.g. Dunlap 2019; Rignall 2016). Meanwhile, some academics argue that Community Renewable Energy (CRE) is a (possible) means for democratizing the energy transition, that does or can provide numerous benefits to local communities contributing to socio-ecological sustainability. Others are more cautious towards CRE, revealing weaknesses in its celebratory accounts (e.g. Berka and Creamer 2018; van Veelen 2018). CRE involves problems and risks too (e.g. Johnson and Hall 2014; Schreuer 2016).

In this article, I transgress a critique of community and non-community RE to conceptualize one of several possible pathways for human and more-than-human prosperity in the face of mounting capitalogenic environmental crises, rethinking renewable energy development for alternative sustainabilities. For this purpose, I first examine the benefits, problems and dangers of CRE. Then, I discuss the diverse and community economies approach developed by J.K. Gibson-Graham, and contributions bridging political ecology with the 'diverse economies' perspective. Building from this, I develop an alternative affirmative framework for RE development under the notion of Community Renewable Energy Ecologies (CREE). CREE signify community economies engaged in small-scale energy 'prosumption' (production and consumption), or medium-scale renewable energy prosumption and sale, according to alternative modes of

ownership, production, exchange and circulation. CREE, as envisioned here, are involved in collective ethico-political decision-making embodying care for and affective relations with humans and more-than-humans. They are engaged in an *oiko*politics directed towards more 'vivacious' and egalitarian ways of becoming, together with humans and others. I identify particular ethico-political orientations for CREE and provide reflections for their constitutive elements to consider (e.g. concerning ownership, finance, labor, infrastructure, and technology). Reframing (C)RE development under this notion and framework widens the possibilities for social experimentation with more equitable and 'thriving' socio-ecological futures beyond capitalism.

2. CRE: benefits, problems and risks

Following Walker and Devine-Wright (2008), Community Renewable Energy projects are typically understood as energy or heat generation projects using renewable energy technologies, where communities have a high degree of ownership and control over energy. Much less widespread than *commercial* renewable energy projects, thousands of CRE projects exist across the world. They are diverse in their organization and ownership, including trusts and cooperatives. They have different motivations behind them, are of different scales, and involve various actors including nongovernmental organizations and the state. CRE literature explores, *inter alia*, the benefits and problems of projects (e.g. Berka and Creamer 2018; van der Waal 2020), the factors influencing their outcomes (e.g. Guerreiro and Botetzagias 2018; Madriz-Vargas *et al.* 2018) and their transformative capacity. Transformative capacity is examined through the viewpoints of energy democracy, degrowth, and social justice (e.g. Burke and Stephens 2018; Rommel *et al.* 2018; van Veelen 2018). The net assessment is that CRE projects provide numerous benefits. These include: greater participation in energy decisions and local autonomy; community or individual empowerment; local socio-economic development; enhancing distributional justice; development of skills and knowledge; and encouraging environmental-friendly behaviors and attitudes (e.g. Hicks and Ison 2011; Walker and Devine-Wright 2008). However, robust evidence for the actual benefits and implications created in practice is thin (Berka and Creamer 2018; Creamer *et al.* 2018; van der Waal 2020; van Veelen 2018). Most research has been conducted in the Global North, centring on the UK, Denmark, Germany, the USA and Australia. Some uncritical celebratory assertions have been made about the (expected) socio-ecological benefits of CRE.

The signifier 'community' does not *necessary* entail socially just or progressive outcomes. Indeed, CRE projects are highly variegated, influenced by numerous internal and external factors and not without adverse dynamics and dangers. In the following sub-sections, I examine the purported benefits (e.g. empowerment, local economic development, skills/knowledge development) against actual benefits, problems and risks. I also discuss further benefits, risks and parameters not usually or adequately addressed by CRE literature (e.g. cultural benefits, interrelationships with resource extraction). The sub-sections summarize the key socio-ecological implications and aspects of CRE as suggested by the literature.

Participation, empowerment and equality

Community renewable energy projects facilitate local participation in forming energy futures, enhancing procedural justice, and can also empower local communities (e.g. MacArthur and Matthewman 2018) and women (Madriz-Vargas *et al.* 2018). They offer a pathway for greater local autonomy and self-determination compared especially to utility-scale renewable energy provision. For example, MacArthur and Matthewman (2018) discuss energy production and efficiency initiatives undertaken by and partnered with Maori *Iwi* in New Zealand, including large (co)owned geothermal plants and smaller RE microgeneration projects (e.g. photovoltaics). Although not devoid of tensions and struggles, they offer *Iwi* a pathway for greater control over their own socioeconomic development and, thus, for self-determination (*ibid*).

A key equity concern for CRE is that wealthier and knowledgeable socioeconomic groups can dominate community energy programs, reflecting existing socioeconomic inequalities (e.g. Creamer *et al.* 2018; Johnson and Hall 2014; Schreuer 2016). For instance, in Germany, CRE initiatives tend to be dominated by men and individuals who are more knowledgeable about how to participate in civil society organizations (Radtke 2014). Participants tend to be well-educated with good incomes (monthly gross

incomes of US$3,829 [€3,500] and above, in Radtke's study). Research on local-scale development projects involving renewable energy in the Global South indicates gender inequalities, in part because gender is ignored in program development (Ahlborg 2017; Winther *et al.* 2018). Some studies mention the inability of poor individuals to obtain electricity from such community projects and similar ones (e.g. Ahlborg 2017; Palit *et al*. 2013).

Hostile policy frameworks can undermine empowerment. For instance, van der Waal (2020) notes that a small community wind project on a Scottish island remains vulnerable to policy change around government subsidy mechanisms leading to reduced revenues, and decisions not to extend the transmission grid. Mey and Diesendorf (2018) explore the evolution of the CRE field in Denmark, focusing on community wind power. They highlight that with a strong dependency on state facilitation and an institutional preference for advancing wind technology to reduce emissions, the field has become vulnerable and the social principles of CRE have suffered. The Danish government provided financial and regulatory support for incentivizing CRE initiatives, facilitating the institutionalization of the field's key principles (*ibid*). In Austria, co-owned and co-operated wind and solar plants have progressively been incorporated into established structures, and adapted to the prevailing sociotechnical regime and economy. This is because they have been scaled up, and taken up by utility companies. Their initial aims have drifted in the process (Schreuer 2016); participation has weakened, and utilities decide on plant management and operation.

Ahlborg (2017) examines a mini-hydropower electrification project in a poor village in Tanzania, funded by national and international donors and implemented and initially owned by an international development organization.[2] She describes a tension between empowerment and dominance because of the project, reflecting growing social inequality. However, some social hierarchies were destabilized within the community, with some individuals experiencing greater social mobility. For example, the NGO prevented local leaders from holding influential positions in the utility and, thus, ordinary villagers gained control over the technical system and service delivery limiting the influence of local elites. While some positive outcomes were observed (e.g. opening of political 'spaces' for shifting power relations within the community), the project was formed by a development logic originating "at higher levels where donors control the financial and time frames of working processes, and project objectives, strategy and system design are based on norms of established development practice and expert knowledge of designing electric power systems" (p. 133). Palit *et al*. (2013) explore India's Village Energy Security Programme, where village energy committees (VECs) own and run decentralized village programs involving renewable bioenergy with assistance from external institutions. They mention, amongst other things, inadequate empowerment of, and training of these committees in many cases. Hinshelwood (2001) shows how external organizations that offered to support a community wind project in the UK (including partial funding) tried to impose their agendas and modify the project's initial ideas and plan, threatening local control of it. Different types of organizations are involved in CRE and capacity-building efforts (Hicks and Ison 2011; Palit *et al*. 2013).

To summarize, CRE projects can lose their transformative capacity over time as others step in, adapting to prevailing economic models and energy systems. CRE projects frequently have to adapt to policy frameworks and the market, and more powerful actors can seize control. Individuals can become marginalized and even vulnerable. If unequal power relations within, and in relation to, communities (e.g. regarding decision-making, income inequality) are not challenged then they can become entrenched in projects, (re)producing or exacerbating existing inequalities.

Local socioeconomic development

CRE projects can generate local socioeconomic benefits, contributing to locally-added economic value, or even to regional economies through revenues, job creation and income diversification (e.g. Okkonen and Lehtonen 2016; Sperling 2017; see Berka and Creamer 2018). While job creation, income generation and revenue diversification from project development and operation are noteworthy benefits, the primary factor determining socioeconomic regeneration is where long-term project revenues are allocated (Berka and

[2] This NGO later transferred ownership to the local utility once it was established.

Creamer 2018). For example, the most substantial changes residents saw from a 900kW community wind project in a Scottish island were either direct or indirect effects of project revenues (van der Waal 2020). Revenues were mainly used to finance some much-desired additional transport services for the island, with many beneficial flow-on effects (*ibid*). In Indonesia, earnings from two micro or small hydro cooperatives[3] were invested in new income-generating or productive activities by villagers, such as a small enterprise manufacturing bags (Guerreiro and Botetzagias 2018). Berka and Creamer (2018) find that investing project revenues in the local community and on socioeconomic regeneration is one of the most 'substantial' local impacts of CRE. Therefore, they contend that "collective funding pools and negotiation processes around their distribution [revenues] towards private versus public goods play a crucial role in determining transformative local impacts of CRE" (p. 3400). Lastly, procuring materials and labor and sourcing capital locally also allow projects to contribute to local socioeconomic regeneration. Local procurement, however, depends on the existence of local supply of labor and services and materials, as well as on scale – for example, smaller projects have been found to source locally more than larger ones (*ibid*). Entwistle *et al.* (2014) demonstrate that the cooperative share model using local capital is a better option for socioeconomic regeneration, reducing the overall cost of borrowing, directly providing income for members, and increasing net earnings and total local GDP impacts.

However, focusing on 'local' socioeconomic development risks assuming a homogeneity within local communities, downplaying inequalities within them and neglecting relevant procedural and distributive justice considerations. It also neglects the disadvantaged communities implicated in unequal power relations and which have limited financial, social and personal resources to pursue CRE (echoing Catney *et al*. 2014 and Mohan and Stokke 2000). This means risking the creation of new regional or sub-regional inequalities when more advantaged regions and communities engaging in CRE capture the most value from surrounding disadvantaged ones (e.g. through subsidization) (Johnson and Hall 2014).

Energy transition is a geographical process with geographies of connection, dependency and control (Bridge *et al.* 2013). This means that energy transition in one place is influenced by more than national politics and local contexts: the relationships between countries, the wider political economy of states, transnational firms, international agreements and so on (*ibid*; see Power *et al*. 2016 for Mozambique and South Africa). In other words, energy transition governance involves complex relations between multiple actors operating across spaces (Power *et al.* 2016). It also involves geographical connections and interactions between places and new patterns of socio-spatial activity (Bridge *et al.* 2013). Energy transitions are uneven socio-spatial processes (Calvert 2016) with uneven social consequences for people and places (Newell and Mulvaney 2013). Socioeconomic benefits from CRE for (some in) one place might entail injustices for (others in) other places. CRE localism, therefore, risks seeing the 'local' as isolated from other scales, places, wider interrelations, broader economic and political structures and associated impacts in other places (see also Catney *et al*. 2014). It neglects the production of geographical differences for economic growth and development, as well as the 'new geographies of winners and losers' and 'new patterns of uneven development' created (echoing Bridge *et al.* 2013).

Capacity building

Active participation in CRE can lead to new knowledge and skills emerging on numerous issues, such as project management and community engagement, and can 'harness' pre-existing untapped knowledge, skills and capacities (e.g. Martiskainen 2017; Walker *et al.* 2010). Capacity building requires some relevant pre-existing knowledge and skills (e.g. technical, legal). Without them, project development can be held back, even where CRE is popular (Berka and Creamer 2018). Moreover, usually, project implementation rests on a limited number of individuals leading projects that have specific knowledge, skills and competencies and new learning may predominantly reflect these people. Meanwhile, limited participation by lower-income and less educated individuals or groups limit possibilities for capacity building.

[3] One coop is hybrid, involving wind and solar as well.

Capacity building directly relates to 'social capital' formulation. Social capital reflects "the intrinsic capacity within which individuals and their social relationships can provide the means for community action capable of achieving shared objectives" (Peters *et al.* 2010: 7601, quoted in Parkhill *et al.* 2015: 62). It involves inclusion in, and creation of, local social ties and networks embedded in trust and conceptualizations of a shared identity, shared visions and a common goal. Strong local social networks and trust are a prerequisite and a potential outcome of CRE (e.g. Parkhill *et al.* 2015; Radtke 2014; Walker *et al.* 2010). Yet, CRE can adversely affect social capital by dividing communities and eroding social cohesion (e.g. Bere *et al.* 2015; Walker *et al.* 2010). Berka and Creamer (2018: 3408) find that "the obtrusiveness of technology, the unequitable distribution of costs and benefits and the degree of broad and deep engagement in the project process" determine positive versus adverse impacts on social capital. Moreover, Middlemiss and Parrish (2010) argue that the social capital in CRE initiatives is formed by the community's cultural, organizational, infrastructural and personal capacity.[4] They examine a Native American industrial-scale, community owned renewable energy initiative in the Northern Greater Plains. They demonstrate that even a predominantly disempowered community can alter its own overall capacity for empowerment and change by creatively drawing on its existing capacities.

Intermediaries play a positive role in capacity building (e.g. Guerreiro and Botetzagias 2018; Ruggiero *et al.* 2014). For example, in the aforementioned Indonesian case, Guerreiro and Botetzagias (2018) emphasize the positive role an intermediary organization played most notably in ensuring that the cooperatives would be financially sustained without external assistance. This was achieved by building on and strengthening existing community capacity to generate income. This ensured villagers would have the economic means to buy RE from the cooperatives. They argue that in a developing country, and especially under a hostile policy environment for CRE, intermediaries as meso-level actors are "a make-or-break pre-condition" for successfully implementing projects, namely for capacity building. Martiskainen (2017) finds that intermediaries pass on new knowledge to other CRE groups and gain knowledge and skills themselves.

Ecocultural sustainability

Aside from avoiding emissions at the points of energy and heat generation, CRE does not necessarily entail progressive ecological outcomes. Research indicates mixed success with better climate change awareness and energy consumption practices amongst CRE participants: in some cases no change was observed, while in others positive changes (for core members) were noted. For instance, six CRE projects in England and Wales did not affect participants' awareness of climate change, but rather were firmly grounded in local economic motives (e.g. income for local farmers, village hall refurbishment) (Walker *et al.* 2010). Rommel *et al.* (2018: 1751) argue that CRE projects in Germany are dominated by "technophile eco-modernists", with only few members being critical of technology and excessive energy consumption. They find "little evidence of a general change in attitudes towards technology, consumption, or equity" emanating from CRE initiatives, most of which rely on the market economy and are in danger of being 'consumed' by the dominant capitalist politico-economic system (p. 1746).

Rogers *et al.* (2012) explore a community biomass heating project in England, initially not motivated by environmental concerns or climate change. These concerns were later picked up by the project's directors. They find shifting views on energy use and willingness to pursue or engage in other RE projects by project directors as a 'spill over effect.' They also find that individuals involved in, or in contact with, the project became familiarized with this technology, influencing uptake decisions. However, the project's potential to alter residents' energy practices towards more sustainable lifestyles "may be relatively weak", probably due to the strong focus on local socioeconomic objectives (p. 245). In a survey including 25 individuals from two community hydropower projects in Wales, admittedly subject to self-selection bias, 67% argued they gained

[4] Cultural capacity is the legitimacy of sustainability objectives in view of the community's history and values, while organizational capacity is "the values of the organisations active in a community and resulting support available for community action" (Middlemiss and Parrish 2010*:* 7561). Infrastructural capacity is "the provision of facilities for sustainable living/initiatives by government, business and community groups", while personal capacity the resources for community sustainability members have, such as knowledge and skills (p. 7561).

greater awareness of climate change, 65% argued they reduced their energy consumption and 48% claimed they installed new energy efficiency measures (Bere *et al.* 2015). In one project, 26 participating households reduced their energy use by 13.4% over a two-week period, but this occurred after energy reduction work using smart meters and energy saving advice was provided by the relevant Trust and government.

Beyond other contextual factors, the key reasons for varied outcomes are initial or *post-hoc* motivations, as well as underlying conceptualizations of technology and conviction (or lack of) to broader change. When motivations exclude concerns about climate change and inducing broader change in society, and rest solely on economic and social benefits for individuals and local communities, then CRE is not likely to have progressive ecological outcomes, such as less consumptive lifestyles (see also Berka and Creamer 2018). Also, as the German case suggests, when technology is perceived as the 'savior' from climate change, then too CRE is not likely to generate progressive ecological outcomes (Rommel *et al*. 2018). In these cases, CRE could even produce 'rebound' effects, such as increased energy-intensive behavior. Moreover, Berka and Creamer (2018: 3414) find that "where CRE was driven by (financial and/or environmental) objectives that do not extend beyond renewable energy projects, it led to business models designed primarily to generate returns for membership-based investors." They conclude that self-consumption projects involving high levels of active user engagement are more likely to generate positive impacts on environmental behavior (*ibid*). Projects with explicit environmental mission statements that use revenues to fund, or complement, community-wide action for nourishing lifestyle changes because of climate change are also more likely to have positive impacts on environmental behavior (Berka and Creamer 2018).

Lastly, how (far) CRE contributes to cultural sustainability is under-researched. In a noteworthy case, however, four community-owned wind projects in Wales and Scotland contributed most notably to language retention and revitalization (of Welsh and Scottish Gaelic) (Haf and Parkill 2017). Project revenues were used to finance, *inter alia*, cultural activities, such as local language courses, traditional music events and community services. Also, the aforementioned Maori case suggests that CRE can counter the overtaking of Indigenous groups by the current neocolonial order and assert their unique ontologies in energy transitions.

From local to global considerations

Various forms of corporate, non-community RE development have been found to involve top-down land grabs and dispossessions (e.g. Baka 2017; Brannstrom *et al*. 2017; Dunlap 2019; Rignall 2016; Siamanta 2019), sometimes including extra-legal practices and deception (e.g. Siamanta and Dunlap 2019). Researchers have found notable impacts on local livelihoods (e.g. direct loss, denial of access to land and resources previously used) and the further marginalization, or impoverishment, of already disenfranchised groups and communities (e.g. indigenous populations, ethnic minorities, fishermen) (e.g. Brannstrom *et al.* 2017; Dunlap 2019; Goraeyb *et al.* 2018; Lawrence 2014; Rignall 2016; Yenetti *et al.* 2016). High intensity, and in some cases violent conflicts between companies or the state and local communities, and within communities have been observed (e.g. Brannstrom *et al*. 2017; Dunlap 2019). Rural gentrification (Dunlap 2019), financial resources grabbing (Siamanta 2017, 2019) and adverse impacts on culture (e.g. Dunlap 2019) are also noted. The latter emanate from altering and/or denying long-established sociocultural practices and human-more-than-human relations.

Some scientists argue that a major shift to centralized RE development facilitates capitalism's continued reproduction and expansion (McCarthy 2015; Siamanta and Dunlap 2019). Moreover, some projects explicitly support industrial and high emissions practices elsewhere (e.g. Dunlap 2019), while those involving carbon offsetting and trading indirectly support higher release of greenhouse gasses.[5] Local economic benefits from a commercial project are often deficient (e.g. job creation, community payments, development projects) and less than for true CRE projects (Berka and Creamer 2018). These benefits can be tokenistic, insufficient and problematic (e.g. Lawrence 2014; Rignall 2016). These adverse dynamics and outcomes can be at least minimized through CRE, while it can provide some actual local benefits as discussed above. However, 'avoiding' poor outcomes depends and the extent to which this is even possible depends on the specific project configuration and power relations involved. While environmental degradation at the points

[5] On carbon markets, see for example Bachram (2004).

of utility-scale RE generation can also be avoided by small CRE projects, for example through the considerate siting of solar panel arrays, not all projects can be socially and environmentally transformative. In general, the literature suggests CRE is closer to socially just renewable energy development for climate change mitigation than non-community, large scale or commercial RE.

There are several crucial issues to consider here. CRE may serve as a 'bridge' between 'roll-back' neoliberalism, where local communities are expected to mitigate climate change through community actions, and 'roll-out' neoliberalism, where they undertake energy projects under neoliberal terms (following (Peck and Tickell 2002; Taylor Aiken *et al.* 2017). The latter includes the promotion of 'personal responsibility' and 'self-care', as well as the formation of 'self-sufficient', 'self-governing', 'rational economic' and 'entrepreneurial' individuals and communities. Castree (2010) identifies these approaches as a principal characteristic of the neoliberalization project. Subject formation in line with neoliberal environmental governance can reach as far as community renewable energy projects, but also drive individual production of renewable energy (Siamanta 2017).

Moreover, CRE and especially projects feeding energy into state or private utility electricity networks are not disconnected from the broader political economy, commodification, neoliberalization processes, and the wider functioning of the capitalist system. There can be the privatization of electricity networks and energy companies, the deregulation of environmental standards for RE investments, and 'partnerships' formed between community and private actors. Further, paraphrasing Burke and Stephens (2018: 85), RE technologies are embedded within a wider industrial system of fossil fuel and natural resource extraction that supports their manufacturing and that generates huge inequalities. For instance, Sovacool *et al.* (2020) find that cobalt (used in wind turbines) mining in Katanga Province, DR Congo and e-waste handling in Agbogbloshie in Accra, Ghana reinforce ethnic and gender inequalities, lowering environmental health through toxic pollution and both depend heavily on child labor, with some children worked to death and drowned.[6] Renewable and conventional energy production currently serves the dominant growth-oriented development model and its supporting culture, although sometimes unknowingly. CRE may be intensifying existing patterns of human exploitation and environmental degradation or destruction regarding, amongst others: raw material extraction for technology development; technology manufacturing; building infrastructure; e-waste handling; and broader industrial production. It also risks replicating the dominant logics shaping and narratives accompanying natural resource extraction and commodification of energy and more-than-human nature. CRE, thus, can reinforce neoliberal environmental governance and the broader ideational, discursive and material workings of the capitalist industrial system.

Any CRE project that does not place these issues at its center (e.g. industrial development, increasing energy consumption, exploitive relations and injustices), or that does not seek to, at least partially, address them, cannot be considered as producing 'Renewable' Energy, as a sustainable and equitable response to climate change. How can we begin to address these issues under the current model of 'infinite growth' and the growing dominance of 'green capitalism' that equates 'development' with capitalist expansion, nourishing market-based relationships? How could CRE contribute to alternative sustainabilities? Before dealing with these questions, I first discuss affirmative world-making approaches and research that can aid in sketching a different approach for CRE.

3. Diverse economies, community economies and more-than-critical political ecology

Gibson-Graham (2006, 2011) challenge the traditional definitions of 'the economy' and dominant understandings of capitalism as a monolithic system. They re-conceptualize the economy as *diverse*, namely as:

> …a landscape of radical heterogeneity populated by an array of capitalist and noncapitalist enterprises, market, non-market and alternative market transactions, paid, unpaid and alternatively compensated labor, and various forms of finance and property (Gibson-Graham 2011: 2).

[6] Both cases concern RE technology: cobalt used in wind turbines, and turbine blade and solar panel waste.

They specifically distinguish between mainstream capitalist, alternative-capitalist and non-capitalist forms of these five aforementioned interrelated dynamics (labor, enterprise, transactions, property and finance) (Gibson-Graham 2006, 2011). Figure 1 depicts the landscape of 'the diverse economy.'

Enterprise	Labour	Property	Transactions	Finance
CAPITALIST	WAGE	PRIVATE	MARKET	MAINSTREAM MARKET
ALTERNATIVE CAPITALIST	ALTERNATIVE PAID	ALTERNATIVE PRIVATE	ALTERNATIVE MARKET	ALTERNATIVE MARKET
○ State-owned ○ Environmentally responsible ○ Socially responsible ○ Non-profit	○ Self-employed ○ Reciprocal labour ○ In-kind ○ Work for welfare	○ State-managed assets ○ Customary (clan) land ○ Community land trusts ○ Indigenous knowledge (intellectual property)	○ Fair trade ○ Alternative currencies ○ Underground market ○ Barter	○ Cooperative Banks ○ Credit unions ○ Community-based financial institutions ○ Micro-finance
NON-CAPITALIST	UNPAID	OPEN ACCESS	NON-MARKET	NON-MARKET
○ Worker cooperatives ○ Sole proprietorships ○ Community enterprise ○ Feudal ○ Slave	○ Housework ○ Volunteer ○ Self-provisioning ○ Slave labour	○ Atmosphere ○ International waters ○ Open source IP ○ Outer space	○ Household sharing ○ Gift giving ○ Hunting, fishing, gathering ○ Theft, piracy, poaching	○ Sweat equity ○ Family lending ○ Donations ○ Interest-free loans

Figure 1: The diverse economy (Gibson-Graham 2010: 228).

Gibson-Graham (2006, 2011) argue that capitalist practices and relations are only 'the tip of the iceberg', with a whole range of numerous hidden economies lying below the water's surface.[7] However, diverse non-capitalist and alternative-capitalist economic practices and relations are mostly unrecognized and 'unvalued.' They have become non-credible alternatives, receding in the background of mainstream economic thinking: they are invisible due to discursive erasure by capitalocentric perceptions and approaches (Gibson-Graham 2006, 2008, 2011).[8] Moreover, "economic dynamics are overdetermined" (Gibson-Graham 2006: 72) and, thus, each aspect of the diverse economy in Figure 1 – social relations, institutions and subjectivities are formed through the intimate interrelationship between, and the effects of, all elements together and not because of one single determinant factor or inescapable structuring logic (Burke and Shear 2014a). Therefore, "the relationship between activities in places cannot be predicted but is open to politics and other contingencies" (Gibson-Graham 2006: 72). And, "relationships, practices and initiatives all become sites of possibility", while "capitalist sites and processes become open to transformation and engagement" (Burke and Shear 2014a: 132). Yet, alternative-capitalist and non-capitalist forms of the diverse economy (Figure 1) are not necessarily less exploitative or more liberating than capitalism (Burke and Shear 2014a; Samers 2005). Samers (2005) argues that when distinguishing between exploitative and progressive forms of the diverse economy, it is important to explore the relationships and processes of production, and the employment conditions in different forms of diverse economies.

[7] They recognize diversity within capitalist activity.

[8] The 'hegemony' of the capitalist system and neoliberalism is sometimes overemphasized, affording less 'power' to existing and possible non-capitalist or neoliberal conceptualizations and alternative relations and practices. However, I concur with Fletcher (2019) that this hegemony exists materially and discursively. This implies that other economies exist within this framework.

This denaturalization of capitalism and the anti-essentialist re-reading of economic practices enables the ontological conception of 'community economies' (Gibson-Graham 2006, 2011). Community economies are "economic spaces or networks in which relations of interdependence are democratically negotiated by participating individuals and organizations" (Gibson-Graham 2008: 28). 'Community' in this approach

> …implies the need to re-socialise economic relations by adopting an ethical approach and recognising the interdependence of subjects and economic practices and going beyond an individualised performance without refusing or eliminating any singularity and individuality. (Gritzas and Kavoulatos 2016: 923)

(New) non- and alternative-capitalist economic knowledges, values, practices, relations and identities are, and can be, enacted in more ethical politico-economic decision-making by subjects. These, then, provide the foundation for 'a post-capitalist politics' (Gibson-Graham 2006), whereby community is a site of becoming, and community economies are the grounds for collective ethical economic decision-making through which new worlds are, and can be, constructed.

Acknowledging climate change, Gibson-Graham, along with others, urge us to rethink how to be humans. And to filter economic practices through an ethics of care for, and affective relationships with, humans and the more-than-human world (Gibson-Graham and Roelvink 2010; Gibson-Graham 2011; Gibson-Graham *et al*. 2013). Specifically, Gibson-Graham and Roelvink (2010: 320) call for an economic ethics that nurtures the "being-in-common" of "all being(s), human and non-human, animate and inanimate, processual and fluid as well as categorical and definite in conception." This involves humans being transformed by the world they dwell in as part of "learning to be affected" (*ibid*: 322; see Latour 2004).[9] Learning to be affected as an ethical practice entails "developing an awareness of, and in the process being transformed by, co-existence." It is the basis for an economy for a more-than-human world (Gibson-Graham and Roelvink 2010: 325).

While these contributions are important for an economic ethics for a more-than-human world, in them environmental action tends to be considered "as a predominantly positive counterbalance to destructive capitalist processes" (Fletcher 2019: 12). This is despite evidence that environmental governance is also diverse, and includes seemingly progressive policies which (can) involve regressive socio-ecological outcomes. An example of the latter is the utility-scale renewable energy production discussed above. Lastly, the community economies approach includes six ethical coordinates around which community economies are being, and might be, built:

1. Survival: What do we really need to survive well? How do we balance our own survival needs and well-being with the well-being of others and the planet?
2. Commons: What do we share with human and non-human others? How do we maintain, replenish, and grow this natural and cultural commons?
3. Consumption: What do we really need to consume? How do we consume sustainably and justly?
4. Transactions: What is the range of ways we secure things we cannot produce ourselves? How do we conduct ethical encounters with human and non-human others in these transactions?
5. Investment: What do we do with stored wealth? How do we invest this wealth so that future generations may live well?
6. Surplus: What is left after our survival needs have been met? How do we distribute this surplus to enrich social and environmental health? (Community Economies 2019: np).

[9] 'Learning to be affected' implies an ongoing learning process.

Some work brings ecological issues more centrally into the diverse/community economies approach, most notably from a political ecology approach (Fletcher 2019; Burke and Shear 2014b). Fletcher (2019) sets out an analytical framework of 'diverse ecologies' that maps diversity in environmental governance: with diverse forms of environmental governance (strategies and practices) and their specific articulations (Figure 2). The integration of different governmentalities (e.g. neoliberal, communal) expressed in diverse economic arrangements is notable. Diverse subjectivities (can) emerge in their wake.[10]

Burke and Shear (2014b) edited a Special Section in the *Journal of Political Ecology* that advanced a non-capitalocentric political ecology for politicizing, reimagining and reconstructing nature-society relations. It explores community interventions, cases from the Community Economies Collectives, grassroots groups, and new collectivities in process and new openings created. The case studies are embedded in, or involve, non-capitalist values, practices, relations and politics, testifying to diverse 'non-capitalist political ecologies.' They examine how (new) ethics, values and knowledge are formed or enacted, reconceptualizing value and politics and facilitating new political possibilities. Johnson (2014) demonstrates how Inuit activists in the Canadian Arctic influenced international deliberations and negotiations for banning Persistent Organic Pollutants through mobilizing affect and reciprocity, and gifting a carving of the Inuit mother and child. She shows that these non-capitalist practices and politics are grounded in the Inuit's particular ethical affective relations with humans, more-than-humans and the land, which are created through non-capitalist subsistence practices. Burke and Shear conclude that semi-autonomous local organization better supports active participation in ethical deliberation and collective action (2014a: 139). Another finding is the "cascading effect of politicization": values constructed also involve the re-scaling of ethical consideration and, thus, local political action may cascade into other forms of political action in other realms. At the same time, "economic practices and logics emerging from the local can jump scales" (Burke and Shear 2014b: 139).

Meanwhile, other affirmative approaches are deployed in political ecology research, building on, *inter alia*, affect, care, animism and pluriversality (e.g. Collard *et al.* 2015; Singh 2013; Sullivan 2013, 2019). For instance, Singh (2013, 2015) explores community forest conservation in Odisha, India. She demonstrates how affective reciprocal relations with forests and related intimate practices of care and nurturing led to non-capitalist ways of valuing more-than-human nature and, thus, to possibilities for challenging market-based conservation. Singh (2018) discusses 'affective political ecology', describing how focusing on affects affords a stronger appreciation of the interconnectedness of all beings. It enables us to (re)think becoming together with Earth others, other-than capitalist human subjectivities, and ecopolitics. Ecopolitics is reframed as embedded in care for the world from "a lived-in or kincentric ecological perspective" (p. 3). In various contributions, Sullivan provides an ontological avenue for more egalitarian and 'vivacious' socio-ecological sustainabilities based on animism (e.g. Sullivan 2013; 2019). Animism is an orientation "to enliven both nonhuman natures and understandings of what it means to be human in intimate, moving and maintaining improvisations with other-than-human worlds" (Sullivan 2013: 55). She sees existing animist ontologies as

> …among the social forces that can be mobilised and affirmed today in (re)configuring, (re)composing (re)embodying culturenature relationships that are enlivened in support of the flourishing of life's diversity. (Sullivan 2013: 60)

Notable is the parallel extension of Foucault's 'care of the self' as care for humans and more-than-humans and life itself, for an egalitarian and abundant ethics of life (Sullivan 2019). Collard *et al.* (2015: 322) call for new socio-ecological futures with "more diverse and autonomous forms of life and ways of living together", or else for "multispecies abundance." They offer political strategies for this, including acting in pluriversal rather than universal ways. This means embracing and enacting ontological multiplicity, for example by reinforcing practices and performances that articulate different worlds than those of imperial capitalism and colonialism.

[10] Governmentality denotes 'the arts of government'; how power is exercised in social relations to formulate the 'conduct' of individuals and govern relations (Foucault, 2008[1978-1979]).

These various approaches provide an affirmative lens through which to envisage, amongst others, the post-capitalist forms CRE can take (forms of enterprise, surplus distribution, subjectivities, etc.), the re-scaling of ethical consideration[11] and ethico-political decision-making for CRE practices.

Philosophy	Principles	Policies	Subjectivities	Practices
Sovereignty (command-and-control)	Centralization Regulation Redistribution	Legislation Taxation Subsidization Fences and fines	Obedience to authority	Property State Private Communal Open access Labor Wage Unpaid Alternative paid Collective Transactions Market Alternative market Nonmarket Enterprise Capitalist Alternative capitalist Noncapitalist Finance Market Alternative market Nonmarket
Discipline (ethical injunction)	Normalization Self-regulation Citizenship	Education Marketing Surveillance	Normality Self-discipline Deferred gratification	
Neoliberalism (incentives)	Privatization Marketization De/reregulation Commodification Market proxies Flanking mechs Measurementality	Direct markets Tradable permits Reverse auctions Coasean-type agreements Regulatory pricing Voluntary pricing	*Homo economicus* Self-interest Benefit–cost analysis Responsibility Competition	
Truth (the order of things)	Divine revelation Appeal to sacred texts Spiritual practice Traditional knowledge	Religious decree Taboo spaces Spiritual possession	Vehicle for divine will Spirituality	
Communal (socialist, participatory)	Socialization Communal production Commoning Participatory decision-making	Common property regimes Worker owned cooperatives Land reform Gifting	Collective responsibility Conviviality Affective relations Care	

Figure 2: Diverse ecologies. (Fletcher 2019: 15)

4. Post-capitalist RE development: Community Renewable Energy Ecologies (CREE)

Ethico-political orientations

An alternative approach to (C)RE development first requires rethinking 'nature' and the world. It requires acknowledging 'nature' and society as belonging to the same settlement (the *oikos*). This means abandoning nature/society distinctions, or subject/object, and the Western consensual vision of 'nature' as external, singular, an object, an ecosystem service provider and a commodity. It means recognizing 'a more-than-human world' (Abram 1996) defined by agency, heterogeneity, complexity and pluralism. It further implies acknowledging that we are entangled with more-than-humans in numerous flows and connections and

[11] This includes, for example, ethical consideration on energy consumption, environmental destruction at the places of resource extraction and labor conditions in technology manufacturing.

relations. Our co-evolution involves humans, more-than-humans, cultures, things, bodies and so on coming together in networks, as well as nature and society evolving together (see *inter alia* Braun 2006; Swyngedouw 2011; Whatmore 2002, 2006).[12] Recognizing a common more-than-human world and evolution affirms the kinship between humans and more-than-humans: that we are kin with and not really different from 'earth others.'

This ontological reframing unveils the interconnectedness of entities, landscapes, processes, flows and outcomes (i.e. of life itself). It enables us to recognize the various socio-ecological impacts of climate change and the broader multispecies violence and injustices engendered by industrial development and (neoliberal) capitalism. More than this, we are urged by this form of 'reframing' to rethink how to be humans. The interconnectedness of relationships, processes and outcomes of renewable energy generation within and across locales, over time and across the value chain must be recognized. There are impacts on humans and more-than-humans and related injustices upstream, downstream and at the intermediary stages of the RE supply chain: from the places of resource extraction, through manufacturing, to energy production. Rethinking 'nature' and the world in this way, thus, invites ethical encounters in renewable energy production across the value chain and (time)scales for 'becoming-in-common.'

As Burke and Stephens (2017) suggest, conceptualizing energy and governing energy systems as commons is pivotal for energy democracy. A radical approach sees RE as a common good, rather than a commodity. Governance under commons-based peer production (CBPP)[13] reflects a distributed network of individuals freely participating and collaborating for producing shared value according to their rules, norms and needs without the driving factor of profit (Giotitsas *et al.* 2020). 'Commonification' rather than commodification of RE not only means changing ownership structures, but also creating common value systems and rules (echoing Giotitsas *et al.* 2020, Burke and Stephens 2017). A relational process of negotiating use, access, care, benefit and responsibility would create this common value (echoing Gibson-Graham *et al.* 2013). Commoning involves more-than-humans. 'Becoming-in-common' means a social system characterized by a relational way of being, doing and benefiting. In this light:

> Working towards "a commons-creating economy" (Helfrich 2013) also means working towards the (re)constitution of relational world, ones in which the economy is re-embedded in society and nature…; it means the individual integrated within a community, the human within the nonhuman, and knowledge within the inevitable contiguity of knowing, being and doing. (Escobar 2015: np).

Ethico-political encounters of this type, and cultivating the anti-capitalist self, means other-than-capitalist subjectivities and a different kind of person (an ethico-political subject, echoing Gibson-Graham 2006). An ethico-political individual emerges from embodied, reciprocal and affective practices and relations with humans and the more-than-human world, someone who cares for other humans and more-than-humans, and life itself as part of caring for the self (echoing Sullivan 2019) and encourages ethico-political decisions for 'multispecies abundance' (echoing Collard *et al.* 2015). This individual promotes "an other power of life that strives toward an alternative existence" (Hardt and Negri 2009: 57). It is a communal subject that nurtures the 'becoming-in-common' and what Fletcher (2019) calls a 'liberatory' or 'communal governmentality.' Namely, exercising power based on collective responsibility, care and affective relations for liberatory ways of becoming together with humans and earth others (see also Figure 2).[14]

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[12] Scholars call these networks 'socionatural assemblages', or 'rhizomatic networks', and our common evolution 'a socionatural evolution.'

[13] On CBPP, see Bauwens *et al.* (2019).

[14] Power also has a liberatory dimension (see Fletcher 2019).

Renewable energy production under CREE can proceed according to collective ethico-political deliberation and decision-making that: 1) acknowledges interrelationships; 2) goes beyond individual and local collective benefits; 3) embodies care for and affective relations between humans and between humans and earth others; and 4) is oriented towards a commons-based economy for more 'thriving' and egalitarian sustainabilities. The six ethical coordinates of the community economies approach above are also important, and those coordinates regarding energy production (Table 1).

Collective ethico-political decision-making under CREE, then, reflects a post-capitalist politics –an *oiko*politics– embodying care for, and affective relations with, humans and more-than-humans from a 'kincentric' ontological perspective (echoing Singh 2018). Such an *oiko*politics is oriented towards more 'vivacious' and liberatory ways of living (Collard *et al*. 2015). Aside from responding to the climate and ecological crisis and transforming the workings of capitalism, it is a progressive composition and performance of our common world (echoing Latour 2004) and so begs "constant negotiation with human and 'earth others'" (Community Economies 2019: np).

To summarize, Community Renewable Energy Economies recognize and support the diversity and autonomy of life and its collective constitution based on cooperation, solidarity, egalitarianism and kinship (Table 1). None of this suggests imposing particular systems of knowledge, values, ethics and politics upon local communities. Rather, we need a *recognition* of the kinship and intimate relations between humans and more-than-humans. Further, CREE reflect what already exists but is 'hidden': socio-ecologies that reject the nature/society binary and embody relational ontologies based on affect and perceptions of 'sacred' or animate more-than-human nature. Relational ontologies are evidenced by a vast array of anthropological work (e.g. Johnson 2014; Sullivan 2010; Viveiros de Castro 2004). They are also articulated in cases of CRE (i.e. the Maori case above) and of local opposition to non-community renewable energy (Dunlap 2019). Lastly, as Singh (2018: 4) elucidates:

> While affective relations and life's generative capacity are object-targets of disciplining and capital accumulation, there is always an 'excess' that escapes capital's grasp (Hardt and Negri 2004; Anderson 2010). This 'excess', or what Massumi (2002) terms the 'autonomy' of affect, opens up possibilities for new modes of being…

Ethico-political considerations for building CREE

I now address how CREE can be formed according to these orientations and coordinates. I focus on the key constitutive elements for RE projects, such as enterprise, labor, technology and financing, and show how specific choices for these can (better) facilitate RE development for more 'thriving' and egalitarian sustainabilities.

Projects for abundant and egalitarian futures

Small RE prosumption projects are most in line with these ethico-political orientations. They entail smaller interventions, less RE technology, less resource use, and can lead to ethical practices discussed above. Meanwhile, medium-scale RE projects, involving prosumption and sale of surplus energy, can provide revenues that can be allocated in supporting other worthwhile community economies or practices. These sales are not profit-oriented. They prioritize benefits for all rather than for the few.

Type	Category	Coordinates/Examples
Community economies	**Survival**	What do we really need to survive well? How do we balance on our survival needs and well-being with the well-being of others and the planet?
	Commons	What do we share with human and non-human others? How do we maintain, replenish, and growth this natural and cultural commons?
	Consumption	What do we really need to consume? How do we consume sustainably and justly?
	Transactions	How do we secure the things we cannot produce ourselves? How do we conduct ethical encounters with human and non-human others in these transactions?
	Investment	What do we do with stored wealth? How do we invest this wealth for future generations to live well?
	Surplus	What is left after our survival needs have been met? How do we distribute this surplus to enrich social and environmental health?
CREE	**Impacts**	How does our energy consumption and other consumptive practices that need energy and resources (e.g. on technology) impact on the climate, humans and earth others?
		Examples: Consider impacts on the climate, human health and 'earth others' from conventional energy production. Consider impacts of RE projects on local groups/individuals (e.g. land grabbing, loss of livelihoods). Consider labor realities in manufacturing RE technologies.
	Survival/ Consumption	How much energy, and what quality and quantity of products, do we really need to consume to live a fulfilled life and flourish along with human and 'earth others'? Do we need to scale up RE production or to scale down energy consumption?
		Example: Consider rethinking specific choices on energy and product consumption for reducing aforementioned impacts.
	Commons/ Encounters	What encounters between humans and between humans and more-than-humans are found in CRE within/across places, (time)scales and the value chain?
		Examples: Consider impacts on 'earth others' from natural resource extraction for manufacturing wind turbines and solar panels (e.g. cobalt, rare earth minerals, oil). Consider exploitive/slave labor for resource extraction and e-waste handling. Consider unequal power relations within and in relation to communities engaged in CRE and procedural/distributive justice.
	Commoning/ Transactions /Investment	How can we (creatively) produce the energy we (wish to) consume, making these encounters more just and reproducing (our) life's material and non-material aspects? What praxes can we engage in for commoning RE, whilst 'becoming-in-common'?
		Examples: Consider small RE prosumption projects for reduced energy consumption and resource extraction, collectively created, shared and managed. Consider more just technologies.
	Surplus/ Support	How can our RE producing activities actively support economies and ecologies with alternative ethical orientations and influence collective ethico-political decision-making for other economic activities and in other domains?
		Examples: Consider financial support to, or alliances with, other community economies, and informative events on CREE for the wider public.

Table 1: Ethical coordinates for CREE.

Enterprise, land and labor: beyond mainstream market logics

Cooperatives are a better option for CREE than other forms of enterprise, as they are collectively owned and managed by their members and include equal voting rights, notwithstanding the shares each member holds. Thus, they are more egalitarian, better enabling collective deliberation and decision-making.

Different types of labor can be involved. Cooperative members can work for self-provisioning (i.e. for providing oneself with energy to consume and additionally individual income for living well). They can also carry out caring labor (i.e. work for individual and collective well-being). Expert labor by non-members may be brought in, for example to install RE infrastructure. This offers opportunities for local individuals. It may be compensated in non-monetary ways, through exchange of services and products, or volunteering. There may not be conventional job creation and wages, but caring and working collaboratively to create common value are recognized. Transparent and fair land ownership arrangements are also key for socially just CREE. Communal or community-owned and private land provided for a power installation can be in the form of an energy share in a commons-based economy. The cooperative can manage the land under collective responsibility and care for the benefit of all involved. Such an alternative economic logic would reduce dependency on monetary exchange, and foster a relational process where benefit, use, access, care and responsibility are negotiated.

Infrastructure, mechanisms and technology for commoning RE

A microgrid comprises small energy generation units within a defined boundary. It operates autonomously, and can be installed in remote areas at significantly lower cost, compared to making connection to central power (see Giotitsas *et al.* 2015).[15] An autonomous microgrid collectively owned and managed by a cooperative is a better option than a long-term connection to a central grid under so-called net-metering, as typically seen in RE prosumption projects. A microgrid can facilitate commons-based RE production, reducing reliance on higher-order systems. Collective decision-making by the cooperative's members can determine the RE share each member will get. Excess RE not consumed can form a common RE pool within the microgrid and be allocated where it might be needed amongst members, avoiding wastage. The infrastructure (microgrid and RE generation units) and the RE produced are collectively owned, managed and shared by the cooperative's members, creating common value.

If the RE project generates surplus electricity (a cap on which can be defined by the cooperative), or the cooperative allows for RE sale, then the microgrid can connect and sell RE to the central grid.[16] A flexible net-metering mechanism allowing revenue generation is the best available option, rather than reduced electricity bills. Feed-in-tariffs (FiTs) and feed-in-premiums (FiPs) are other options. In the commonly-used 'auction systems', cooperatives may get marginalized in favor of centralized producers. The RE produced is collectively owned and shared by the cooperative and excess RE is collectively managed. Nearby microgrids can form a larger peer-to-peer (P2P) grid operating under the same rules as the microgrids involved, with excess RE from each microgrid forming a bigger common RE pool managed by the cooperatives. Excess RE can be allocated to microgrids within the P2P grid (Giotitsas *et al.* 2015) according to collective decision-making that attends to the needs of the communities involved based on care and solidarity, after which any excess can be sold. Collapse of one microgrid would not compromise the system (*ibid*).

A microgrid is part of a more just economy. Collective decision-making on RE technology is also important. For example, this could mean choosing solar panels manufactured domestically under better working and labor conditions than those from the main Asian suppliers. Technology should be locally sourced, through exchange trading systems if possible. Advancing commons-based peer production means utilizing open source software, open machinery and, where suitable given energy outputs and connection issues, open RE technologies that can be manufactured locally.[17] The aim is for CREE to 'bypass' as much as possible the mainstream market and advance alternative socioeconomic paradigms that prioritize common value based on collective responsibility, collaboration and care for humans and 'earth others.'

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[15] Giotitsas *et al.* (2015) suggest microgrids, a common RE pool and open technology in peer-to-peer (P2P) modes.

[16] Halton Lune Hydro, a community hydro scheme developed by a housing cooperative in North West England, is an example. It supplies up to 1,000 MWh of electricity a year. http://haltonlunehydro.org

[17] For details on open machinery see OpenSourceEcology (2020). For open RE technologies see Raniersolarpanel (2020) and Kostakis *et al.* (2013).

Financing and surplus: supporting other performances

As Hinshelwood highlights, when "a community group initiates an idea and *leads a project, sourcing funding directly*, there is a greater potential for residents to *maintain control of the ideas*" (2001: 95, emphasis in the original). In this light, self-financing under cooperatives is a good choice for CREE, as it reduces dependency on others, better facilitating inclusive democratic negotiation and decision-making by members. Crowdfunding platforms that support open and commons-oriented projects (e.g. the Goteo platform) can generate funding for energy projects, together with capital from members. For example, services, materials and infrastructure can be contributed by platform members. Any innovation (e.g. organizational, technical) can then be openly shared to the platform (see for example Hidalgo 2015 on Goteo) for use by other communities and for familiarizing other individuals with this post-capitalist economic practice.

Cooperatives are a good option for the sale of surplus renewable energy. A cooperative is not profit oriented and better enables focusing on more egalitarian and 'vivacious' ways of becoming. Net earnings are not divided according to shareholding structure, but rather *pro rata* amongst members according to the volume of transactions they have conducted with the enterprise (Bauwens *et al*. 2016). When part of the net income from sales is allocated as a return on capital shares, profit distribution is subject to a cap, and cooperatives do not have legal obligations to *maximize* return to shareholders (Jahanisova *et al*. 2015). Financial speculation of shares is usually forbidden, discouraging maximization of return on capital, aiding the cooperative's long-term existence and initial motivations (*ibid*). Monetary wealth generated can be shared also with non-members. Namely, earnings can be partly distributed amongst CREE members under a cap for the reproduction of their lives' (non) material aspects and partly allocated to existing or new community economies and/or (new) local economic activities and initiatives. CREE, then, can directly support ontological multiplicity and other transformative practices. Alternatively, some earnings can be partly allocated to communities across the value chain for creating further common value.

Organization and operation: care, affect and openness

Cooperative governance offers equal voting rights for members, without barriers to enrolling new members (Bauwens *et al.* 2016). A key factor is the inclusion of less advantaged individuals who can usually join in projects by providing labor instead of capital, retaining the same right to a share in earnings and renewable energy (see Jahanisova *et al.* 2015). Alternatively, each (prospective) member can provide a small percentage of additional capital for collectively enabling these individuals to actively engage in projects on more favorable terms. Moreover, collective responsibility, solidarity and care for others are pivotal for project operation and for collectively deciding how common (pool) renewable energy is allocated within and to other microgrids (e.g. RE shares). Also, if possible, provisions and agreements with a central grid can be made for selling RE more affordably to poor households outside the microgrids, also reflecting care for less advantaged individuals.

Making all information on strategy, business, finances and so on open access enables knowledge sharing with, and use by, other CREE and the wider public. This reflects values of openness and sharing of CBPP and could influence ethico-political decision-making by non-members. Finally, a strategy of replication (i.e. more smaller cooperatives than one larger) could facilitate stronger affective social bonds and interpersonal connections between members and non-members (echoing Hicks and Ison 2011).

Capacity building and alliances: enacting other worlds

Drawing on the different existing capacities within local communities can significantly contribute to capacity building and successful project operation. Further ways to build capacity include building knowledge and bridges between CRE or CREE projects and existing community economies (for example, members of the Community Economies Collective) for sharing information, experiences and skill development. This is important for less-connected or remote communities. Producing common value in this way can foster broader CREE networks of support and solidarity for post-capitalist futures, and may include collective explorations of new open software or renewable energy technology. New collaborations and affective relationships along the RE value chain can bind (distant) communities together. Further, informative and educational events for familiarizing the public with this form of RE development, as well as on broader issues on energy

consumption, climate change, industrial development and so on, can foster the re-scaling of ethical considerations by non-participating individuals. Alliances with community or intermediary organizations can help with project implementation and collaborations with communities involved in the RE value chain.

Good capacity building can facilitate the 'uptake' of CREE through new alliances. The alliances proposed here are important for facilitating a broader *oiko*politics and global transformations. They require careful examination and explicit attention to maintaining CREE orientations.

5. Conclusion

This article has discussed one possibility for alternative sustainabilities, reframing the development of renewable energy and forming the notion of CREE. This framework and the notion are not prescriptive, but describe a different focus, ethico-political orientation, and particularities. They are open to (re)conceptualization by local knowledge and experience, research, and an ongoing learning process. Ultimately, the precise configurations of CREE rest on negotiation at multiple levels and social innovation, as CREE reflect social laboratories for new more just, enlivened and 'abundant' socio-ecologies. CREE should not be *a priori* judged as more progressive or less exploitative than other RE production forms. CREE outcomes cannot be assumed nor predicted, as research shows that practice can diverge widely from theory. Socio-natures are heterogeneous, complex and (often) unpredictable.

The article employed critique and its lessons in forming an alternative affirmative approach for RE development and in providing specific suggestions, without these taking a secondary role. While critique and talk of alternatives to capitalist practices can indeed sometimes reinforce the centrality of capitalism as a reference point, deploying critique productively is necessary for articulating other worlds *beyond* capitalism. This means affirming both 'the hatchet' and the 'seed' of political ecology and working beyond the sticky binary of critique and affirmation (Alhojärvi and Sirviö 2018).[18] I argue that CREE, as envisioned here, are better aligned with mitigating climate and ecological crises and more 'thriving' egalitarian futures for humans and more-than-humans than conventional approaches to renewable energy.

The alternative framework sketched here echoes calls from within political ecology for finding possibilities amidst devastation, and for forming other worlds (e.g. Alhojärvi and Sirviö 2018). The article is only a starting point: not all aspects, interacting processes, technology issues or prospects for CREE were covered here. Transitioning away from capitalist RE development to CREE is not easy. Amongst other things, it requires supporting individuals and communities who lack the ability to alter the power relations they are embedded in, and strengthening their capacity for pursuing CREE. For example, this means mobilizing other-than-capitalist valuation logics and languages in different arenas. It also means sharing knowledge, skills and (financial) resources with less knowledgeable and affluent groups. Materializing CREE further requires action and struggle to generate (more) favourable legislative frameworks where they do not exist. This entails building new alliances and capacities between social movements and between various actors for political contestation targeted at local, regional and central governments. Scientists can aid in these endeavours and actively support the building of CREE, through participatory action research for example.[19] The latter can be particularly helpful for shifting unequal power relations within and surrounding communities.

This article does not reflect a hopelessly optimistic view, but rather an affirmation that new and more just socio-ecological orders can come into being; if the history of social movements and struggles has taught us anything it is that struggle and collective actions can indeed change the world, little by little.

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[18] On the 'hatchet' and the 'seed' of political ecology, see Robbins (2012).

[19] See for example Ulsrud *et al.* (2018) for an action research project on village-level solar power systems in Kenya.

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