R&I for a Fair Green Transition

Project review and policy analysis

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[10.2767/651078](https://doi.org/10.2767/651078)

Publication date:
2024

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Campo, G., Deer, J., Mørk, S. D., Fyhn, H., Larsen, A. G., Khitous, F., Klöckner, C., Kropp, K., Lazar, F., Lombardo, G., Matthies, A.-I., & Raines, D. (2024). *R&I for a Fair Green Transition: Project review and policy analysis*. European Union. https://doi.org/10.2767/651078

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Executive summary

The European Green Deal promises to implement measures to encourage a profound change to our lives, cities, and societies, so that we can restore a better, more harmonious and balanced relationship with our planet. The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels. A driver of the Commission's process is the Just Transition Mechanism which seeks to limit the impact of the changes that will be required on the most vulnerable Member States through tailored resources.

This report discusses the research in Social and Human Sciences (SSH) funded at the European level via Horizon 2020 (H2020) and the type of academic publications, which emerged between 2017 and 2021, and address the relation between green policies and the labour market in particular. It specifically considers what gaps there are in the research in relation to the human and social costs of the green transition, regulatory reform and, to the required reforms in education, and technical and vocational training to equip youth for the future job market. In the final part of the study, drawing on the contribution of a panel of experts, consideration is given to other important research themes which have not yet emerged either in project funding or in the research literature.

Projects and publications

The study of the research in Horizon 2020 (H2020) projects includes over 4,000 projects which have a SSH dimension. From the published objectives of each of the projects a landscape of topics covered was constructed by the current research linked to the social science and humanities' dimension . Each project is located on the landscape according to their similarity across a number of characteristics. Projects with more specific relevance to the green transition policies and labour market topics were also identified and located in the broader landscape. The analysis of the funded projects has shown that the majority take an economics perspective when looking at the effects on the labour market and that there are few projects which assess the broader socio-cultural dimension, or the impacts of the changes brought by green transition policies on individual and community identity. This is not a surprise for two reasons: most of the projects analysed are funded by the top-down programme of cooperation, which in H2020 had an intentional and well-defined economic and quantitative approach, and the fact that the study of policy and other shocks on labour-markets and employment is well rooted in the discipline of economics.

The analysis of the H2020 projects has also identified clear differences between projects' approach: for example, local versus those with a more 'global' perspective. The study shows that the local projects focus on the impact of natural disasters and the successive disruption caused, such as the effects of flooding, modelling of risk management and social interventions, including support for changes in work conditions and safety. Research with a more 'global' perspective focuses on understanding climate change and rising temperatures to address the need for legal frameworks in support of global governance. It also looks at the global chain effect of climate change driving population mobility.

The analysis of the H2020 projects already shows an intrinsic disciplinary divide between economics and the political sciences, which co-exist in parallel research tracks and

subject methodologies. They also differ in terms of quantitative and qualitative approaches. In a different dimension it is possible to find a few socio-cultural studies which mainly relate to the profound inequalities that the fast implementation of green policies is creating in communities and society.

The analysis of the SSH academic literature is based on identifying the main topics contained in the policy literature around the green deal and then identifying the main policy related topics. The policy topics were then used to identify the publications which have the most relevance to Green Deal policy issues and the connection to labour issues. While there is a large SSH literature with relevance to Green Deal policies the number of publications, which also include the labour market dimension, fall from tens of thousands to just a few hundred. The main features of the research topics identified in this Green Deal literature are a focus on education and skills as key for creating labour markets and economies that are more resilient to external shocks and more capable of recovery. Research also highlights the differential effects of labour market shocks, whether they are experienced more intensely in specific industry/business sectors or concentrated in geographic locations. The results also show that the majority of research is drawn from those fields most connected to the study of labour markets.

The final part of this report considers the views of a network of scholars bringing a set of examples of current and emerging research trends. Although the examples of future research are not exhaustive, recommendations coalesce around the need for funding to address specific issues and to use both quantitative and qualitative research methods. For example, future funding needs to be directed to research on education and human centric solutions, and a better link between local and global studies from all aspects of SSH investigations. New research trends have been identified: for example, social disruption and impact of green transition on society and its labour environment; attention to communities, cultural identities, and historical and cultural longitudinal studies. An important trend is emerging around theoretical and methodological approaches of legal studies, framing the green socio-economic transition. It is of great importance to reconcile the economic and political perspective of such issues and start modelling environmental decision policies and their impact on employment, entrepreneurships, education, and lifelong learning for the sake of adaptability, resilience and the recovery capacity of the economy and labour market. Key funding must also be channeled to behavioural and social studies combined with better framing of cultural differences to improve the understanding of different local solutions to risk management, local business development and household improvement interventions.

The final and more general recommendation for Horizon Europe and national funding is to integrate the dialogue of different disciplinary approaches further, even within SSH research, and to draw from a wider spectrum of contributions, including historical and literacy studies, in order to provide a larger set of crucial evidence to develop further and ensure the success of the Green Deal policy.

1.   Introduction

1.1. The background

The adoption of the Sustainable Development Goals Agenda in 2015, combined with the rising cost of unsustainable development and the impact of climate change, has made countries' green transition a global priority agenda. The European Green Deal ([1]) aims to make Europe climate neutral by 2050, boost the economy through green technology, create sustainable industry and transport, and cut pollution.

The converging phenomena of strong economic growth, heightened dependence on technology and more extreme temperatures are driving up energy needs. The war in Ukraine has highlighted a major pressure on energy bills and the dependence of several European countries on Russian oil and gas.

The EU's industrial policy (2021) rests on three pillars: the green transition, ([2]) the digital transition and global competitiveness. The bloc plans to spend EUR 1.8 trillion in public funds between 2021 and 2027, 30% of which is to be invested in countries' dual green and digital transitions.

However, the reaching climate neutrality by 2050 requires huge capital expenditure and long-term plans to upgrade the power sector and decarbonise the industry. These plans must take into account the different national energy development models and how a just transition is feasible and realistic. Regions which depend on fossil fuels and carbon-intensive industries will be particularly affected and will undergo a profound economic, environmental and social transformation ([3]).

In 2021, then Frans Timmermans, Executive Vice President of the European Commission, said that it is key to work with the regions in Europe most affected by the transition, such as the mining regions, so that the Green Deal gains widespread support and has a chance to become a reality ([4]). This marked the establishment of the Just Transition Mechanism ([5]), which has the ambition to ensure a fair transition towards climate neutrality . As Timmerman said: "We must ensure that this transition is just, or there just will be no transition… we will need everyone to work in the new economy, but then everyone will have to have the skills to be able to work in a new economy and this demands a lot of both the private sector and public authorities to make this happen." ([6])

([1]) The European Green Deal official webpage https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

([2]) This was followed up, after the analysis carried out in the present publication, by the Green Deal Industrial Plan, announced on 1st February 2023.

([3]) See https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

([4]) Executive Vice-President Timmermans' Speech for the Eurogas Annual Meeting 2021 https://ec.europa.eu/commission/commissioners/2019-2024/timmermans/announcements/executive-vice-president-timmermans-speech-eurogas-annual-meeting-2021_en

([5]) The Just Transition Mechanism official web page: https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

([6]) Executive Vice-President Timmermans' Speech for the Eurogas Annual Meeting 2021https://ec.europa.eu/commission/commissioners/2019-2024/timmermans/announcements/executive-vice-president-timmermans-speech-eurogas-annual-meeting-2021_en

The European Commission is seeking to ensure that jobs lost in one industry to the green economy can be recreated elsewhere. The Just Transition Mechanism ([7]) seeks to limit the turbulence on the most vulnerable Member States through tailored resources. This mechanism, which is part of the European Green Deal's Sustainable Europe Investment Plan, mobilizes public and private investment to a cumulative total of at least EUR 1 trillion that was presented by the European Commission in January 2020. Moreover, the Social Climate Fund will also play a role in financing temporary direct income support for vulnerable households and in supporting measures and investments that reduce emissions in road transport. Yet we know that having tools available does not necessarily imply an effective use of the resources.

The green transition will have a considerable effect on our societies and cannot be implemented with top-down policies alone. Attention must be paid to people and citizens, companies, and vulnerable regions. Some social policy schemes are addressing issues of reskilling, and facilitating employment in new trades, improving households, and fighting energy poverty. SMEs have been encouraged to move to green technologies attracting investors in public and private sectors and easier access to loans. Nonetheless, there are entire regions in Europe that are still in need of technical assistance, investment in renewable energy and capacity building for new jobs in the green economy, and sustainable transport.

More research about the social impact of the Green Deal is definitely needed, in terms of technological transformations and tools but also on the human and social costs of the green transition, regulatory reform and an overhaul of education and technical and vocational training to equip youth for the future job market.

Attention of scholars and policy makers is focused on the issue of inequality. Concerns about the potential of the dual digital and green transitions to exacerbate social inequalities is particularly relevant when it comes to the prospect of jobs being displaced on a wide scale. The green transition has the potential to create social and economic disruption at a local level in areas, which currently depend on large-scale polluting industries both for employment and local economic stability. This situation has already led to some governments approving new coal plants in the full knowledge that these will prove to be both un-economic and against green transition goals but will provide social stability in the short term.

1.2. Outline of the report

The report is structured in five parts, an introduction, two parts dedicated to data analysis of projects in H2020 and academic publications; whereas the last fourth part based on contributions from a panel of experts from relevant academic research fields provides some examples of more focussed topics in current and future research. The final part makes some observations and recommendations across a wide range of disciplines.

([7]) The Just Transition Mechanism (JTM) is a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. It provides targeted support to help mobilise around EUR55 billion over the period 2021-2027 in the most affected regions, to alleviate the socio-economic impact of the transition. See https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

Part 2 and 3 focus mainly on a range of data gathered from research projects funded under Horizon 2020. Text data were harvested using the stated objectives of the projects, through keywords and reading of project abstracts, to create a body or corpus of the text. From the analysis of the corpus, the emergence of common themes and topics occurring across the corpus were derived.

A similar process – described in more detail below – created a corpus of text from the abstract texts of the most relevant academic publications which examined both green transition issues and labour markets. The analysis, similarly, created from the texts, present the main themes and topics of the academic literature, which address green transition and labour market topics and also presents an overview of the state of research in these areas.

Part 4 merges information on the research themes identified in Part 2 and 3 with the contribution from the panel of experts involved in the task force, giving some examples of on-going, new and emerging research not already highlighted in the previous analysis. This part of the report is organised by potential scenarios and, for each one, specific research areas are highlighted. The topics are introduced by a brief paragraph on the state of art and some references on the main literature review, followed by a second paragraph on the gaps in SSH funded research about the specific topic and a third paragraph on the proposals and recommendation to address these gaps.

The final part is a summary of conclusions from the evidence in the report, along with some recommendations drawn from all the contributions and the data analysis.

2.   Data analysis

2.1. EU Funded research projects data collection: Methodology

This study focuses on Horizon 2020 (H2020) funded research. It analysed projects awarded across all the challenges in Pillar Two and all the projects in the European Research Council. From this dataset the European Alliance for Social Sciences and Humanities (EASSH) team was able to identify the topics of projects, which were most relevant to the green transition agenda of the Commission. The analysis high-lighted the role that research related to the green transition has been playing as a set of related topics within this corpus ([8]).

The main data source was the EU CORDIS database ([9]) containing all research projects funded through the Research Framework Programmes of the European Union and the European Research Council Executive Agency (ERC). Members of the EASSH team had already constructed a dataset comprised of an initial sample covering more than 80,000 projects and 435,000 participants from the first framework programs funded up to early 2019. From this sample, the team identified 4,013 social sciences and humanities projects. To identify the topics/themes of the projects the team used the published objectives of each project.

This analysis was based on a three-step process. First, it identified the position of SSH projects in H2020 in general (including ERC). Second, it focused on SSH research within the green transition narrative. Finally, it inserted into the analysis identifiers to recognise the position of projects which related to labour/employment. These three steps have enabled an understanding of how topics move across thematic areas and disciplinary methodological approaches regardless of the type of scheme (bot-tom up or top down) in which these projects emerged.

The dimensions of the maps were formed by Multiple Correspondence Analysis (MCA) ([10]). The first dimension (horizontal axis) is the one which describes most of the variance, the second dimension (vertical axis) the second most variance and so on. When the dimensions have been decided they are called axis. The actual naming of the axis was based on a qualitative review of the projects along the two axes, based on reading the project abstracts. An example of this naming process can be explained by looking at figure 2. The first axis runs from 'technology' to 'identity'. The projects at the technology end are characterised by topics such as optimise, cloud, solution, and system and for the identity end they are feminist, indigenous, and anthropological. These topics, along with a reading of the project descriptions of the projects, helped inform how the axis should be classified.

Different maps have different axes. The maps of the green transition topics are recomputed in the MCA so as to optimize the variance along the axis. This is a

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([8]) At a later stage, this analysis could be extended to include research projects funded prior to H2020 to identify the early emergence of research relevant to the green transition agenda and the connected societal impacts.

([9]) EU CORDIS provides information on all EU-supported R&D activities, including programs (H2020, FP7 and older), projects, results, publications https://cordis.europa.eu

([10]) In statistics, multiple correspondence analysis is a data analysis technique for nominal categorical data, used to detect and represent underlying structures in a data set. See Le Roux, Brigitte., & Rouanet, Henry. (2004). *Geometric data analysis: From correspondence analysis to structured data analysis*. Kluwer Academic Publishers

requirement when conducting MCA's as this is the optimal method of showcasing the relational nature of the projects and their topics. The focus change of the different axis also helps to highlight the point that the different subspaces (or subsets of the larger corpus) have different foci. The projects focusing on green transition tends to have a different focus than the average H2020 funded project. To understand the space, it is therefore necessary to understand what shapes the space. Therefore, the axis changes names from map to map depending on the density of type of projects that populate that area.

Topics and terms in the centre of the maps are typically the most used among the ones mapped. Not only are they frequently used, but they are also used equally by all projects in the space. Examples of this are some of the terms in the centre of the SSH map, which are international, European, and research. These terms can be quite generic, but they do help to characterise an overarching theme of the space. The overarching theme of this map is the focus on European research, which is what would be expected, and helps to confirm that this method is an accurate way to define the space.

2.2.   Analysis of results: Locating the SSH projects

The results of the analysis are in the form of maps of the landscape of themes and topics. The main method of locating the projects which deal with the theme of green transition used keywords to search for them and then assigning the individual projects a score. If a project had a certain score (in this case above three) it was included in the category of green transition. The keywords (see list below) were determined by reading the EC websites containing a full description of the policy priority in Green Transition ([11]).

The keywords were an important method when choosing the projects. The keyword-count was kept relatively low to avoid getting unclear results but also it was important to retain a balance for the right distribution of keywords, as too few words are also problematic.

The mapping provides an approximation of the location of each project across the disciplinary/topic-based research landscape. It also provides information on the proximity of projects to their neighbours in the landscape. The proximity of projects indicates the extent of the connectedness or nearness of the projects in terms of the topics they address.

Figure 1 shows that the majority of SSH projects funded in Horizon 2020 fall along the 'Economics' and 'Technology' axes as demonstrated by the overall shape of the cloud. A more even distribution of projects with a cross-disciplinary balance would have resulted in a rounder cloud. The contours of the cloud also show that the concentration of projects is close to the same two axes, namely technology and economics.

([11]) https://ec.europa.eu/reform-support/what-we-do/green-transition_en#ecl-inpage-665

Figure 1: Cloud of projects – SSH in cooperation programmes
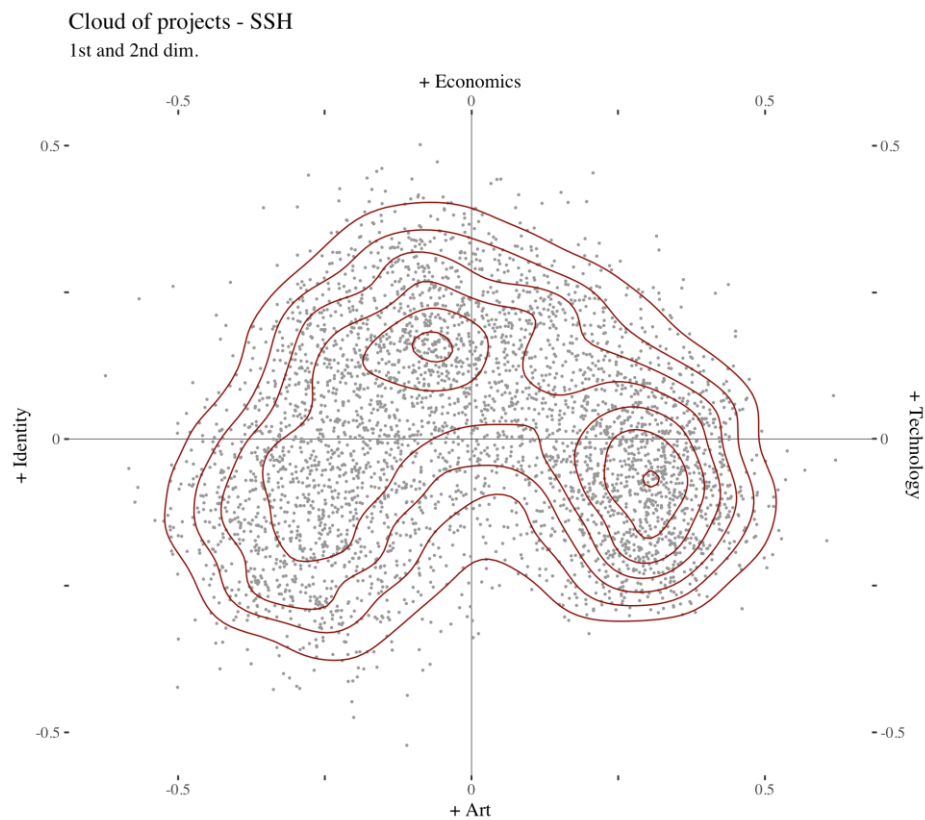
The findings in Figure 1 are not surprising as this map locates projects awarded in the Societal Challenges which has a top-down approach and a really strong preference for research in technology and economics analysis.

The map also shows a lower concentration of projects along the 'Art' and 'identity' axes. In fact, not just a lower density but an absence of projects along the 'Art' axes. (fig.2, shows a crescent shaping to the cloud of topics).

Figure 2: Frequent terms in the space of SSH topics

Frequent terms in the space of topics - SSH
1st and 2nd dim.
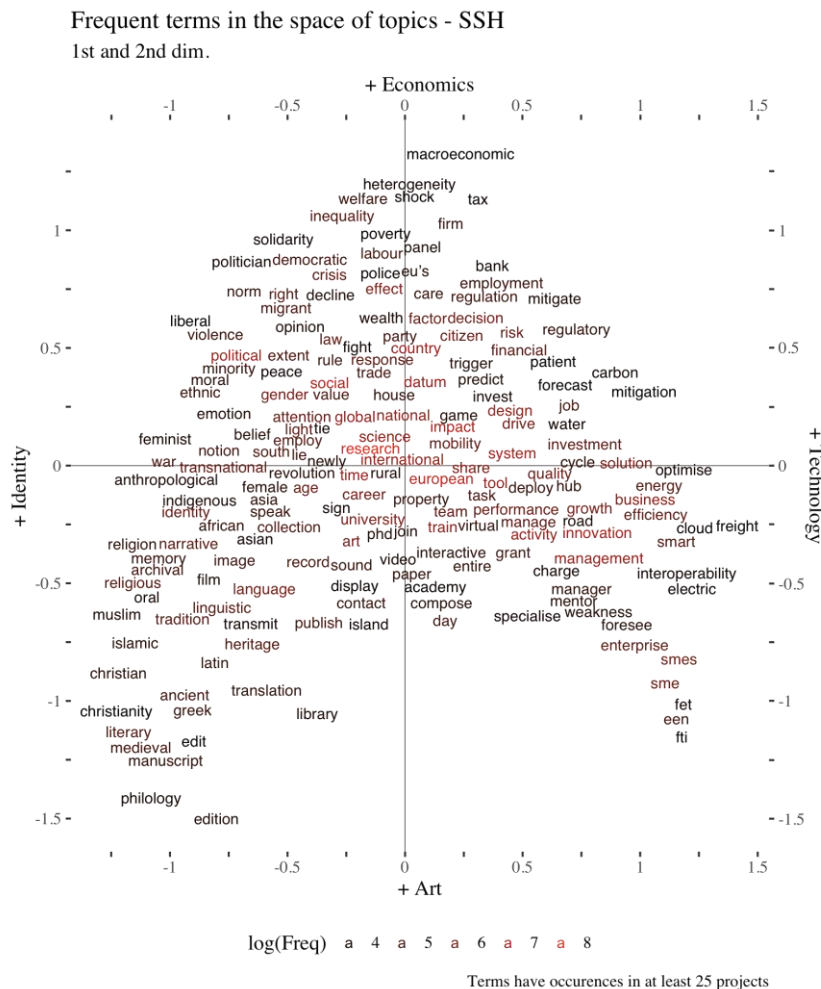
It is our view this absence is due to the under-selection and underfunding of Humanities research in H2020. This view is supported by the EC monitoring reports of the integration of SSH in H2020 ([12]). The lack of projects relates to the range of topics called for under the Societal Challenges pillar of H2020 which, with a published work programme and annual/biannual calls for proposals under defined themes and topics, are biased towards projects which appear along the 'economics' and 'technology' axes.

The team also looked at the overall purpose of the projects in terms of the expected 'outputs'. Our analysis detected a bias towards outputs, which we have labelled 'Products', for use and application, rather than 'Research' which would indicate a more academic set of outputs. The other axis demonstrates the distribution between economics-based topics and arts-based topics. Again, in this there is a strong skew towards economics-based topics, and some towards 'product' outputs rather than 'research' outputs (see fig. 3).

Figure 3: Focus on research vs product

Frequent terms in the space of topics - SSH
2nd and 3rd dim.
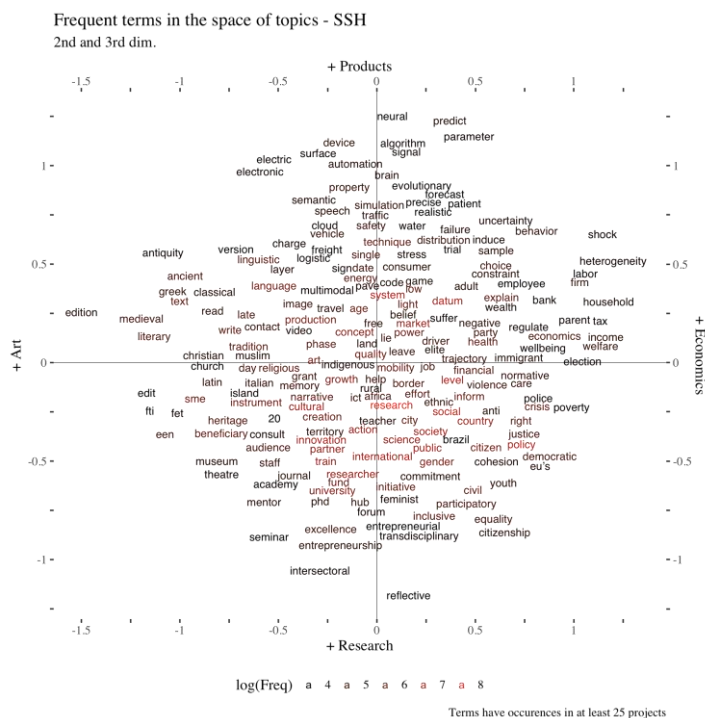
From this analysis it is possible to infer the following conclusions about projects related to the economy and market (fig.4 and fig 5):

- The majority of projects addressing these topics are placed along the technology and economics axes. While there might be projects related to work and labour along the other axes, these would be in the minority.

- Although collaboration is a pre-requisite of this pillar of H2020, there is a particular emphasis on cooperation between different types of public and private organisations, especially with projects focused on business, which is quite a high proportion of the whole. A lot of parties are involved in these projects, with a mix of universities, research organisations and for-profit companies. The observation here is that projects that involve participants from a range of business sectors and public authorities may improve the chances of real-world effects of the projects, and research can feed more readily into policy-making, and less into new knowledge development.

Figure 4: Location of Market

Figure 5: Location of Economy

2.3. ERC and SSH topics

The overall set of topics appearing in the projects funded by the European Research Council were also mapped (see fig.6). The technical extreme is characterised by topics like climate, food, environmental, and DNA. The other extreme, political science, is instead characterised by topics such as citizenship, conflict, legitimacy, and activist. The horizontal axis goes from humanities to market focus. The humanities extreme consists of topics such as writing, Islam, translation, and music while the market extreme is characterised by allocation, financial, firm, and consumer (see fig. 6).

Figure 6: ERC topics

Figure 6 shows again how the relationship with projects on labour and labour relations is tied in particular with the discipline of economics, but it also shows that ERC projects include a new dimension focused on historical studies.

In the upper left quadrant (fig.7 below) between technical and market there are topics such as biodiversity, forecast, monetary, and fluctuation indicating a space for mathematical explanations of social issues There is however not a high concentration of topics in this quadrant, so making any interpretations about this space must be done carefully. The lower left quadrant between market and political science presents a gradient of topics from the political science axis to the market axis where topics transform from solely political topics such as democratic, legitimacy, and justice to more market oriented political topics like labour, welfare, and corporate and ending up being primarily market topics.
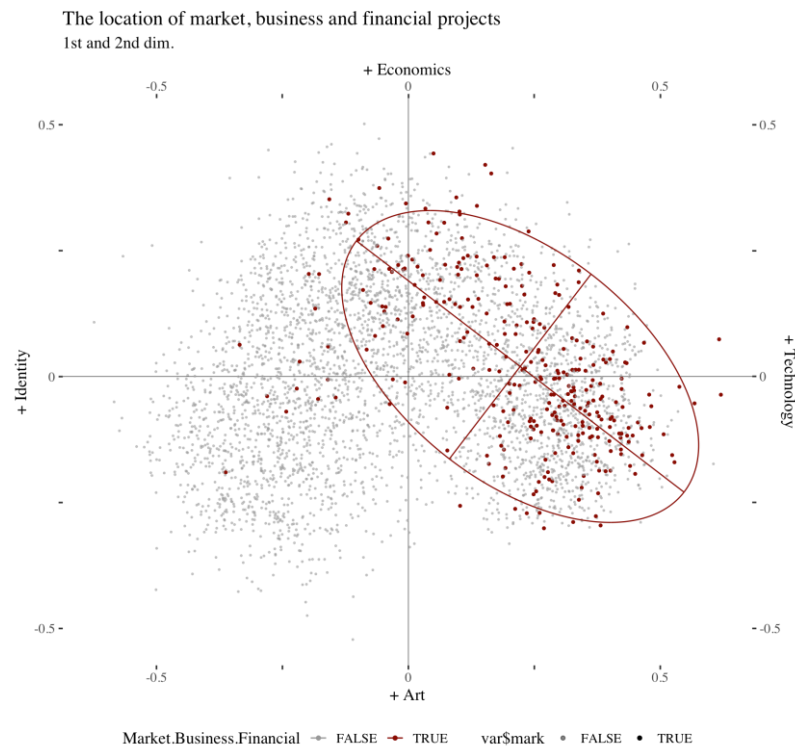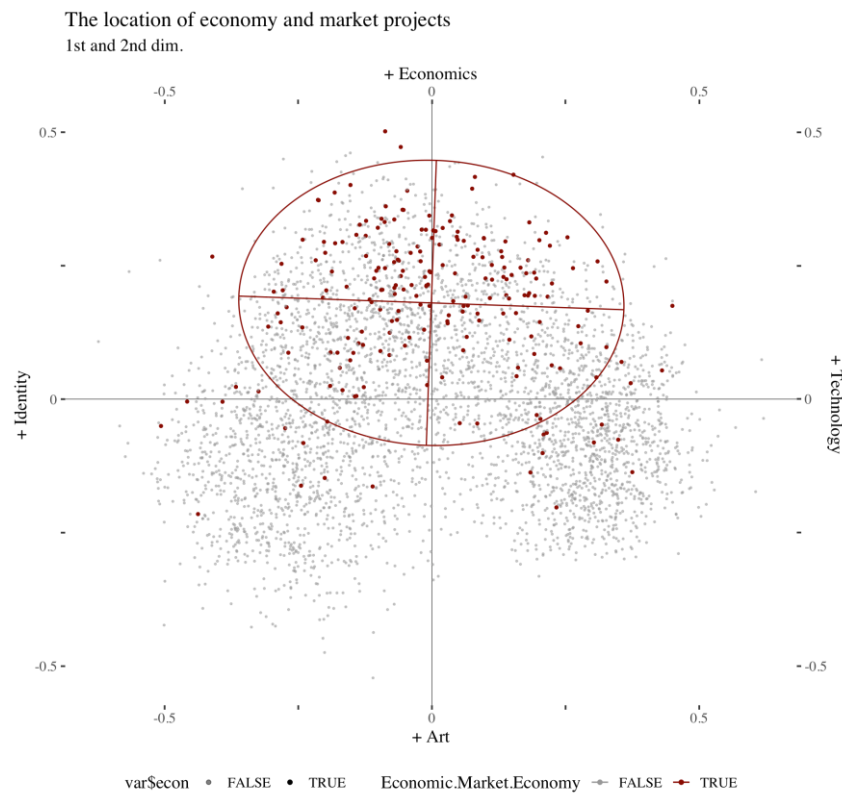
From humanities to technical in the upper right quadrant, there is a space focused on archaeology and history and topics like isotope, ancient, reconstruction, and continental. In the lower right quadrant, there are topics like transnational, philosophy, war, and aesthetic. These topics seems to indicate a focus on culture and science in an international and political perspective.

The market/history dimension concentrates on projects with topics such as shock, trade, and capital. At the opposite end of the axis are projects with themes with a broad historical focus. Looking at the culture/society axis, topics like literature, analytical and intellectual characterise the projects towards the culture end of the axis. The society end contains topics such as wealth, transition, legal and principle.

The following conclusions could be drawn on these themes:

- As with the SSH Societal Challenges space, the work-related projects are trending towards the market axis and again very little work presents along the other axes; (see fig.7).

- The inclusion of the term labour, does once again, broaden the ellipses as opposed to topics where the term is not present (see fig 8.)

Figure 7: Location of market

The location of market, price, and consumer projects
1st and 2nd dim.

Market.Price.Consumer — FALSE — TRUE   var$mark • FALSE • TRUE
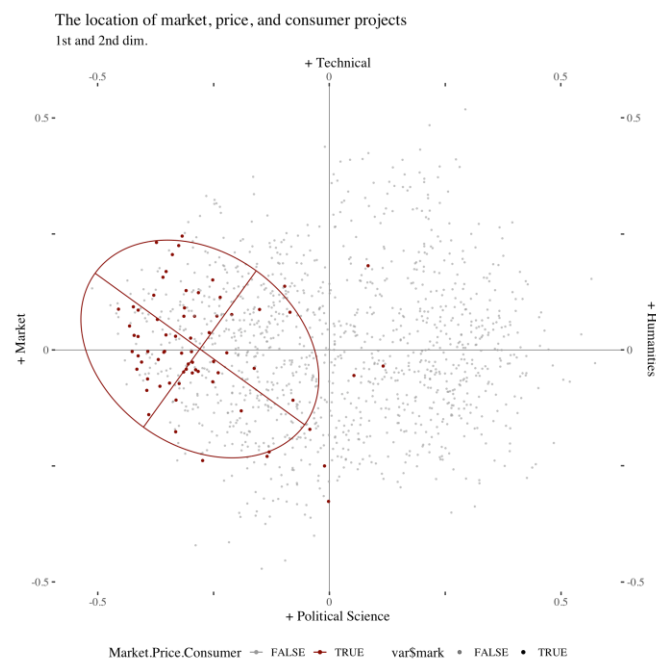
Figure 8: Location of economics

The location of economy, labour and household projects
1st and 2nd dim.
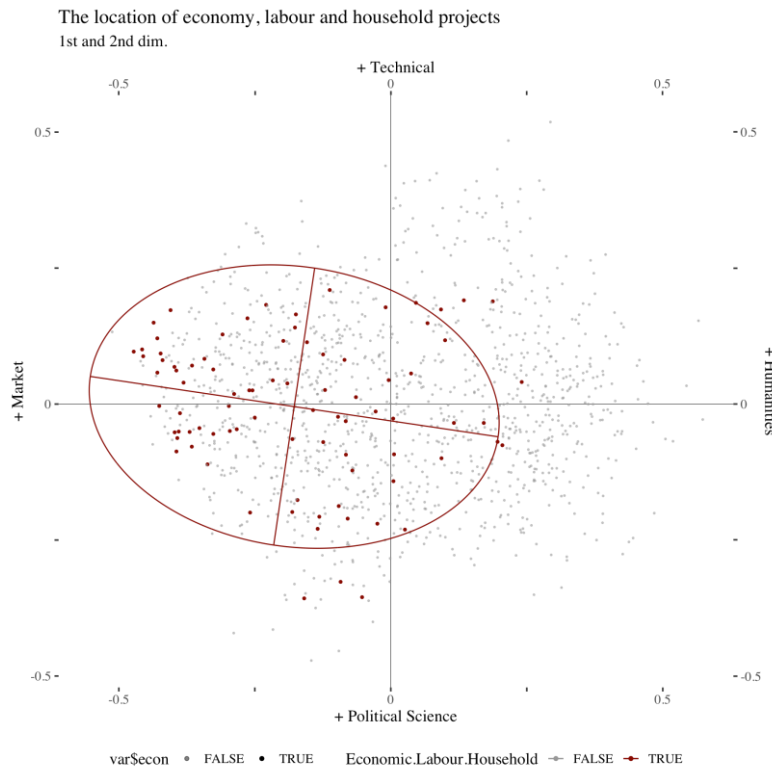
2.4. Projects related to green transition

The green transition map (fig.9) has a far more rounded overall appearance, which indicates a broader array of interconnected research topics and themes. The observations are made along the two axes: market/politics and local/global. On the market/politics axis, at the market end are projects connected to themes of emission, commercial, renewable, and business. At the politics end the concentration is around topics such as culture, gender, population, and policy making.

The keywords have been determined from reading the EC websites containing a full description of the policy priority ([13]). The following keywords have been chosen:

- Green

- Environment

- Climate

- Sustainable

- Conserve

- Policy

([13]) See EC Green Transition https://ec.europa.eu/reform-support/what-we-do/green-transition_en#ecl-inpage-665

- Carbon

- Emission

- Transform

- Energy

- Recycle

- Alternative

Figure 9: Green transition topics

Frequent terms in the Green Transition space of topics
1st and 2nd dim.

log(Freq)   a   2   a   3   a   4

Terms have occurences in at least 25 projects

The local/global axis is a little more intuitive to interpret. Local topics include municipality, administration, and partnership. The global end of the axis is characterised by projects with topics such as world, power, minera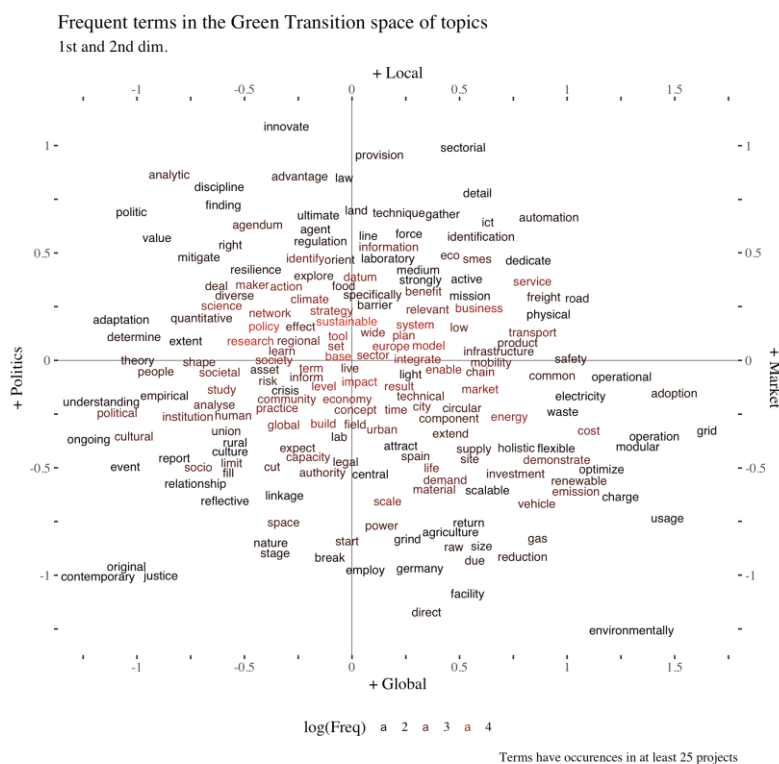l and environmental. Interestingly 'climate' is associated with local issues such as flooding or renewable energy, while 'environmental' is associated with global topics such as weather patterns or rising temperatures.

Projects with topics connecting to labour, market, industry, and economy (fig.10) are few in number and located towards the market end of the axis, indicating that there is little in the projects connected to this topic which have core social science themes, and in particular are not including political science/policy research dimensions. They have a bias towards implementation outcomes.
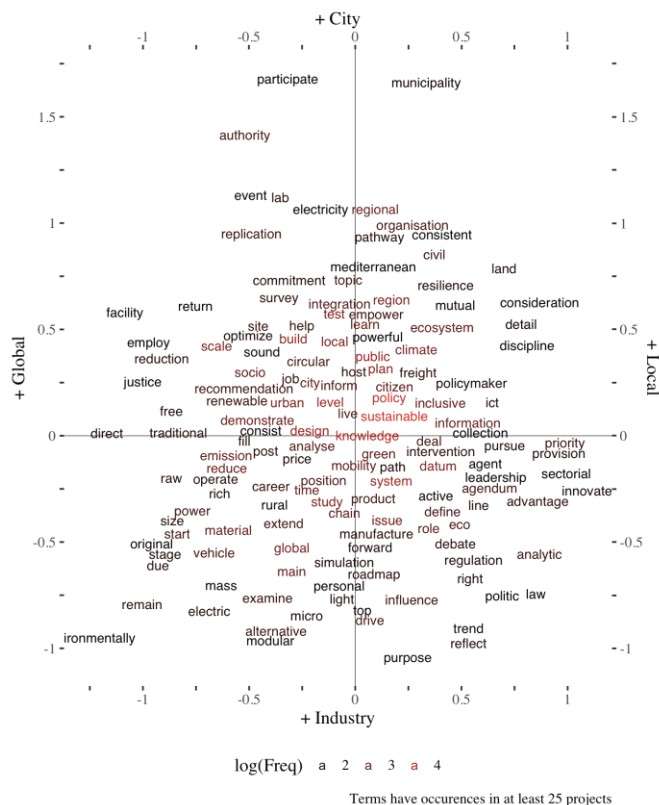
- A major theme among the green transition projects focuses on green transition as an end goal and not as means to another end.

- There is a split between local and global projects, which is mirrored in the terms: 'climate' and 'environment'.

- Humanities plays a very small role in this space.

Finally, another dimension between local and global is the one characterized by city and industry. Urban studies are characterized by focusing on transport, road/infrastructures, and innovation; these topics indicate a focus on local practitioners and how they work with green transition. At the other end, around industry, the attention is on demand, emission, protection, and price, again a very economics approach. Not surprisingly legal aspects of this axis appear more at a local rather than global level, showing how regulations and legislative frameworks are very much implemented within regions or small municipal areas. Similarly, a focus on resources, transformation and use/product is also more under local jurisdictions rather than having a more international dimension. In projects addressing the global dimension, attention is mainly focused on industry.

This analysis shows that at present there is a dualism at play between topics which have a more local understanding versus those which are better addressed at the global level. In SSH research on green transition some topics remain mainly at the local level (probably because they are also related to local policies) whereas others have a more transversal and cross border approach because they are methodologically transferable. What is required now are more methodologically structured studies which can address all the dimensions and topics of the green transition (see fig. 10).

Figure 10: Green transition between industry and green cities

Frequent terms in the Green Transition space of topics
2nd and 3rd dim.

log(Freq)   a 2   a 3   a 4

Terms have occurences in at least 25 projects

2.5. ERC green transition

Performing the same text analysis on ERC projects with topics around green transition the variety of interests and areas of research involved is much wider (also shown by a more rounded cloud see figure 11 below).

The ERC has a bottom-up approach to the award of funding. The topics for research are determined by the applicants themselves. The programme explicitly provides funding for high-quality academic research. The cloud of topics produced from the work supported by ERC shows a more balanced set of topics – the cloud is evenly rounded unlike the cloud of topics for the societal challenges topics. This suggests an even distribution of research projects across a broader research landscape.

The academic community working across the research landscape has – in theory – an equal chance for support regardless of the disciplinary field. Indeed, the programme is structured in thirds; Life Sciences, Physics and Engineering, and SSH. This compares with the 25% of the overall H2020 budget which supports SSH research.

Figure 11: ERC and Green transition projects
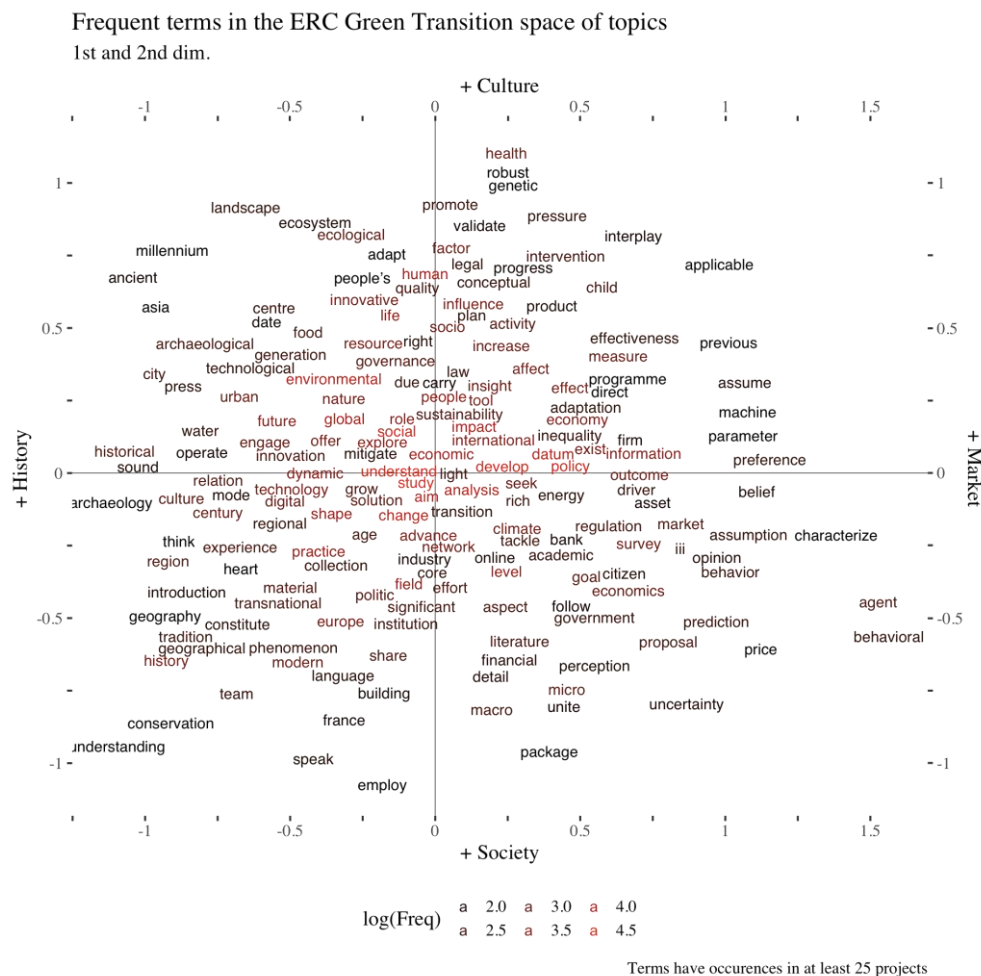
- Unlike the H2020 Societal Challenges projects green transition space, there is a larger humanities presence in ERC projects.

- There is still a separation between the terms 'environment' and 'climate'. It is however less divisive than before.

- As with the H2020 space, there is the same tendency for projects to be goal oriented, to discover 'products' that can solve challenges.

2.6. Green transition and the labour market

The ellipsis created from the topic *financial.impact.assessment* is rather large com-pared to the other ellipses. As the tolerance for including projects in certain topics has been kept the same across the maps this means that this topic is not as unifying as some of the other ones. Under the ERC programme there is some incentive for re-searchers to identify specific areas in the landscape – niches – which are not heavily crowded with similar research from other researchers. Again, a structural difference with the Societal Challenges pillar, which through the top-down definition of priority topics will tend to encourage clustering.

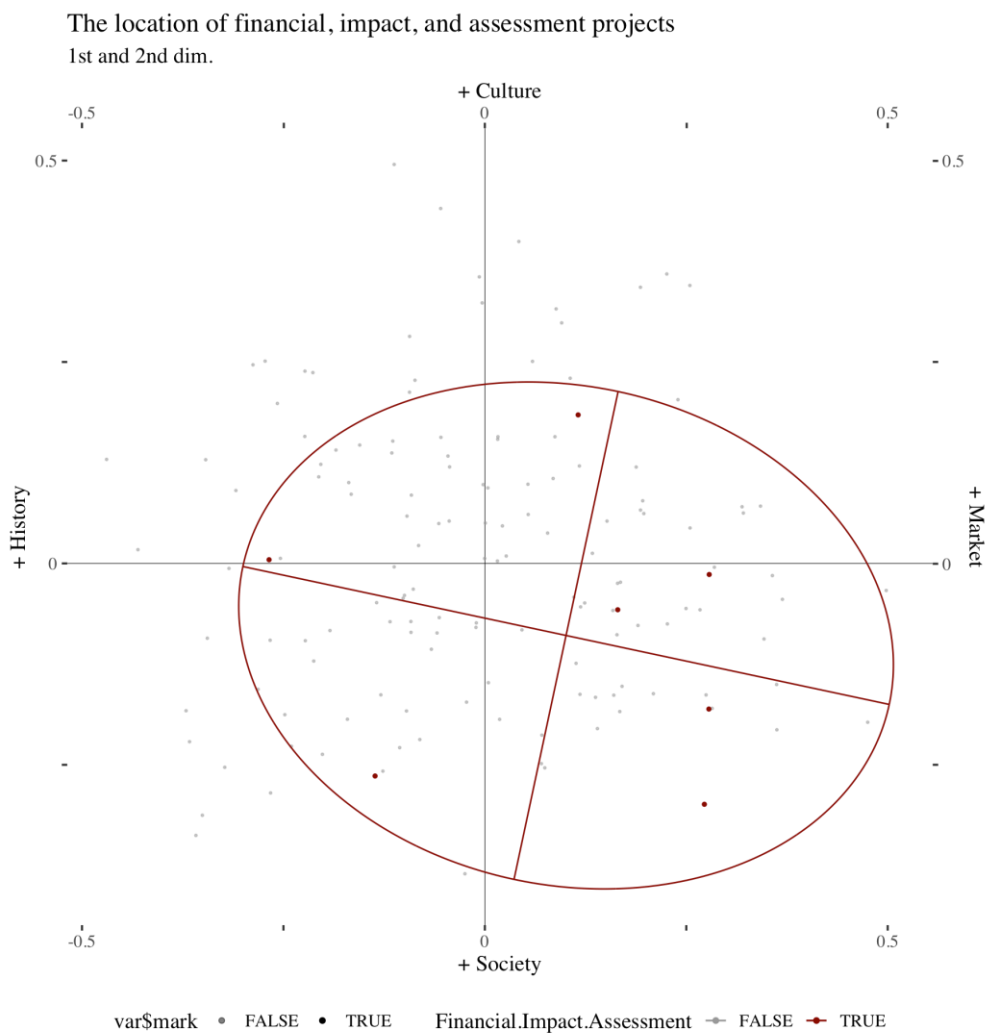**Figure 12: Location of financial, impact and assessment**

The location of financial, impact, and assessment projects
1st and 2nd dim.

Figure 13: Location of economy, development and experiment

The location of economy, develop, and experiment projects
1st and 2nd dim.
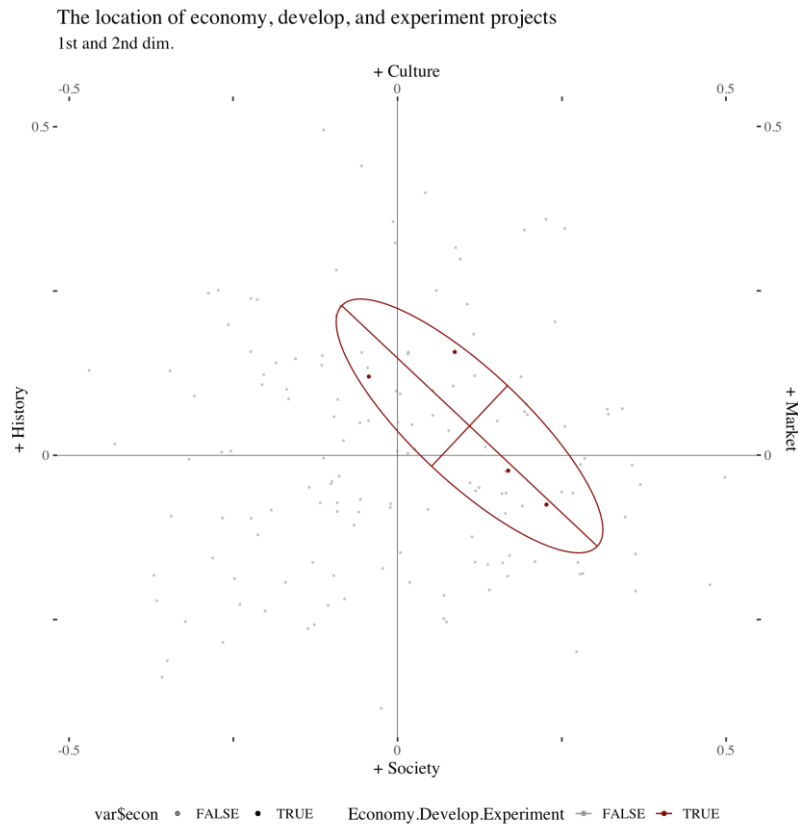
2.7. Conclusions

The topics identified under the ERC programmes are significantly different to those under the Societal Challenge programme. The projects themselves are large in scale and scope and encourage the clustering of a range of topics that does not occur under the Societal Challenge programme. Analysis is showing itself to be sensitive to this structural distinction between the two programmes. Nonetheless, the ERC projects do still demonstrate a skew towards the 'market' end of the horizontal axis.

The specific observations drawn from the maps above show that:

- Both the ellipses are tending towards the market axis and are encompassing a large area:

  o The financial, impact and assessment ellipsis is broad in all four directions.

  o The economic, develop and experiment ellipsis stretches from culture towards society.

- A common theme for the projects is their focus on behaviour and their perspective is often on a city scale.

- The projects from the topic of financial, impact and assessment, attempt to model green transition and climate change in already established financial frameworks.

More generally, the data analysis shows how the green transition topic, especially when referring to the impact on labour, is strongly focused and concentrated around addressing an economic issue rather than the social context. The analysis of the SSH projects, regardless if funded in the cooperation programme or in ERC, demonstrate a tendency towards a market based analysis. This is not very surprising, but it is important to highlight. There is a highly applied and quantitative approach in European funding and the more qualitative aspect of SSH disciplines engaged in these topics remain a minority.

3.   Bibliometric analysis

3.1. Bibliometric methodology and analysis

This part of the study reviewed academic publications available via one of the main academic publications databases, Web of Science (WoS) ([14]). This dataset covers the majority of academic publications across all fields of science and, along with Scopus, are regarded as the most comprehensive resources for journal publications, particu-larly those published in the English language. However, Scopus and Web of Science only covers about 30-40% of SSH publications. They are also home to more 'interna-tional' journals where the language of publication is English. The results of this study, therefore, will not pick up more nationally or locally based work and work published in national or regional languages.

These datasets were used to identify publications in the fields of SSH published in the last five years and to isolate those which were most relevant to the effects of policies for the green transition on society and the economy and related to policy making processes.

The analysis determined the main topics of the policy space by examining publica-tions produced by the European Commission which present or discuss the policy challenges of the Green New Deal, set out in the New Green Deal announcement by President von der Leyen as a major policy pillar for her Presidency.

These policy documents were the source from which the main policy topics for the Green New Deal were identified. These topics were then used to identify the main academic publications which related to the Green New Deal. Using the policy topics, searches were constructed which identified publications relevant to the Green New Deal topics and also included reference to 'Labour Markets'.

Our search sought to identify publications with the following characteristics:

- Research themes that were relevant to the policy themes of the Green New Deal and green transition;

- Included a further theme relevant to Labour Markets;

- Published in the period 2017-21;

- Held in the SSH libraries of WoS to exclude work published from the natural and technical sciences.

Just over 500 publications from the WoS library that contained at least one of the main themes of the Green New Deal policy documents and had a second reference to labour market themes were extracted.

From the academic articles identified in WoS the text of the publication abstracts of the 500 publications were then extracted. From this a corpus was created of nearly 200,000 words from publications with high relevance to the themes of Green New Deal and labour

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([14]) The database Web of Science - Clarivate is a trusted publisher independent global citation database. See
https://clarivate.com/webofsciencegroup/solutions/web-of-science/

market. The same process as applied to the Green New Deal policy to identify the major themes of the academic literature was then used.

3.2. Bibliometric analysis

Using the keywords used in the publications record in WoS, this bibliometric analysis places co-occurring keywords into a landscape of networked keywords or topics. The network mapping identifies those keyword topics, which have the strongest/nearest relationships. The size of the nodes reflects the frequency that keywords appear in the publications. The proximity of keywords in the mapping relates to the frequency that the keyword pairs appear together in publications.

The construction of thematic maps uses the co-occurrence of keywords as indicators of themes which appear frequently in the academic publications extracted from WoS. The more connected a term is with another set of terms the more this is an indication that terms are appearing in publications and are likely to be cognate in terms of the broader themes discussed in individual publications. Also, that themes are appearing in co-cited publications at a higher frequency and in the mapping are shown in proximity to each other. From this it was possible to plot identifiable topic/thematic clusters. The coloured clusters in Figure 14 show there are 7 clusters of research themes that emerged from the corpus of articles published on 'green deal/climate' and labour market themes.

Figure 14: Thematic map
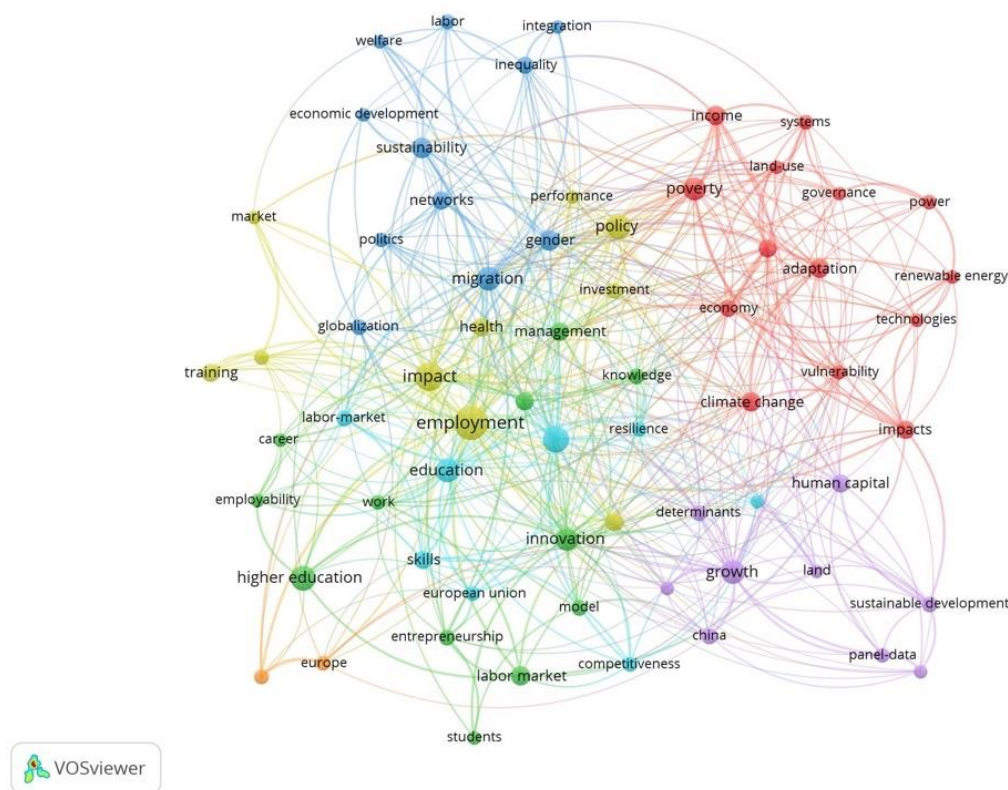
Using network mapping for the co-occurring keywords helps to provide a structure for the topics that appear in the publications. Taking the clusters in turn the underlying keywords can be used to identify the original publications, which lay under each of the clusters. By selecting a sample of those publications and close reading of the abstracts the themes of the underlying research publications can be identified more specifically, and the more detailed descriptions of the research focus can be created.

The first observation on what emerged from an overall interpretation of both the articles and the corpus is that the orientation of work in this area of scholarship is from the perspective of an effect or shock – in this case of green transition policies – on labour markets. The study of labour markets is well established as part of Labour Economics, and as such the publications strongly represent an economist's perspective on the effects of green transition policies on the labour market.

The majority of work therefore is an examination of what factors influence the operation of labour markets; innovation, technology, immigration, climate change, education, geography, industrial/business sectors. It also includes politics and labour organisation.

There is a significant disciplinary cultural divide. Traditionally, the labour market is a topic for economists and for an analysis that mainly looks at the impact on the economy rather than society. However, labour and labour relations for example have also been a topic for sociology, anthropology and ethnographic research looking more specifically at the impact of social movements and identity issues. There is also a fundamental methodological difference, with economic research relying heavily on quantitative studies, compared with the more qualitative approach from sociology, anthropology and ethnography.

The following section highlights some of the research themes that emerge in the cluster areas and shows how some of the work, using the network maps, branches between clusters/topics.

It is important to note that in identifying relevant research, terms and themes are used which emerge from an analysis of relevant policy documents. Terms such as green transition and Green New Deal are relatively new in policy discourse. As such these are not terms which appear as frequently in related academic literature and so the body of work identified as highlighting previous relevant research is embedded in the literature of 'climate change' and 'sustainability'. These are the areas where labour market and green issues are most closely connected.

In Figure 14, the 'red' cluster inhabiting the top right-hand corner of the map brings together work on climate-change, adaptation, economy, poverty, power, technologies. This cluster highlights a significant cross-cutting issue, which applies to all areas under the green transition, which is that the green transition policies are an example of an exogenous shock on the economy and which then feed through to labour markets. In the section below the research work relates to other forms of exogenous shocks (innovation, technology, digital-tech, public policy) but remain relevant in the context of the green policies which create similar shocks. Effects will be concentrated in business sectors and/or regions.

In particular, the work highlights employment in agriculture as a sector which is likely to be affected by policies related to green transition and which will require significant adaptation by agri-business employees. This cluster picks out research on other groups within the labour force which are less able to respond to adaptation; older workers, migrant workers, citizens with lower levels of education.

In the underlying research there are examples of more qualitative research that connects citizens/employees personal experiences and expectations of future employability. Also, how these perspectives reveal the degree of 'openness' to future adaptability – whether those currently employed in business sectors such as agriculture are open to the ideas that as change occurs their future employment will be in new roles, in different business sectors. Other research looks at the labour market/employment implications for other 'traditional' business areas, which are most vulnerable to green transition policies such as raw material extraction, energy production and transportation. These industries are often dominant employers in towns and surrounding regions and have helped to shape community cultures and are an important part of the identity of communities or individuals within communities. The examples of qualitative research provide a different perspective of the effects and responses to policies and on policy actions which are designed to mitigate the effects of the primary policy. Considerably more work is needed to understand the effects on culture and identity on labour market changes around some of the carbon intensive industries and environmentally harmful practices in agri-business.

The red cluster (fig.14) incorporates a body of work around labour markets and poverty. It connects to priorities articulated under Green Deal policies to ensure that they deliver on high employment, productivity, strengthen social cohesion and reduce the risk of increased levels of poverty due to policy failures driving economic shocks. The 'poverty' perspective highlights the risk in least resilient communities and social groupings and the need to ensure 'inclusivity' in policy development.

Employability (see fig.15), arises in themes in the lower left sector of the map (green cluster). This area has work exploring the contribution of education, primarily in higher education, to the future employability of new entrants to the labour market. Many Higher Education Institutions are adopting curriculum developments to improve the employability of graduates in a future where flexibility and career adaptation will be required. HEIs and the broader education sector are also contributing to 'innovation and competitiveness' of regions and nations as cornerstones of stronger economies.

Figure 15: Employability
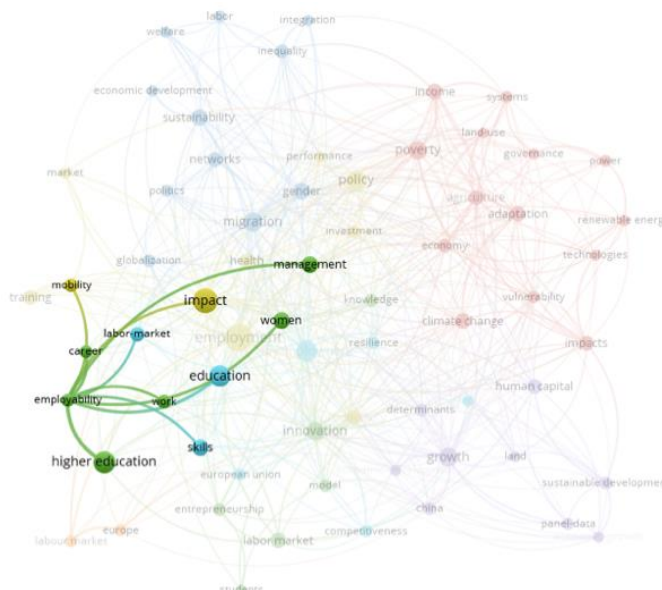
There is a concentration of research work looking at the position of older workers and engagement in life-long learning and continuing professional development to access new skills to ensure employability in the labour market of the future. This research work highlights the need for local/national policies to address the issues of future employability and transition to retirement for older workers in an economy and labour market experiencing significant transformations.

Figure 16: Entrepreneurship
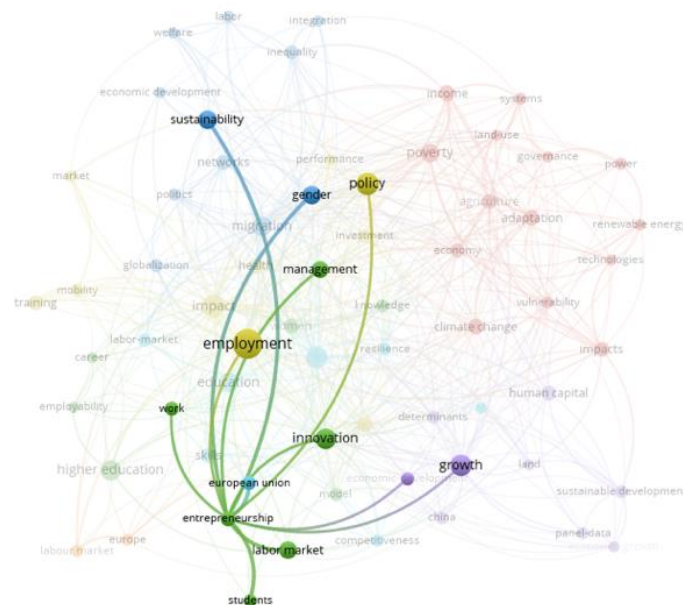
In the entrepreneurship cluster (Fig. 17) (green cluster) employability and entrepreneurship are connected. Entrepreneurship is a driver of employability for young workers and graduates but also, more broadly, 'entrepreneurial' economies are evidenced as having greater resilience through flexibility and responsiveness to changes in the economy and feeding through to labour market demand.

In particular to highlight 'green entrepreneurship', this is widely recognized as playing a crucial role in transitioning societies towards sustainability, yet sustainable ventures often have difficulty in attracting talented management employees that are necessary to scale their sustainable opportunities.

The 'gold' coloured cluster in the bottom left corner of the overall map (fig. 14) has a focus around employment. This cluster of research has lower direct connection to the Green Deal or green transition effects on the labour market but when these are seen as drivers of shocks the work on other drivers of shocks has relevance. The cluster incorporates work on reduced employment as a result of environmental policies, or related to the introduction of new information and communication technologies.

In relation to the environmental and climate connected effects, research themes emerge looking at the effects of mobility on labour markets. The differential opportunities for mobility across age groups, business sectors and regions are highlighted. Mobility of labour is a mitigation against the effects of changes in the economy and the worst effects on labour markets especially where green transition policies affect a business sector with a close connection to local employment. Those made unemployed by the effects of policies on local labour market may respond by becoming more mobile as they seek new employment opportunities. Opening of labour-markets as a response to climate change

driven mobility has implications for other areas of the labour market with the potential for significant numbers of new entrants. More qualitative work looking at the ability of migrants to compete in new labour markets is required to understand the skills they bring, whether they are appropriate in the context of a labour market in a new place, and, whether new members of the labour market are able to find opportunities through social capital/social networks. New migrants have fewer networks they can tap in to assist job searching/matching. Where those former employees are not mobile, research findings point to the destructive effects of long-term unemployment in specific geographies and the differential effects on regions and nations of EU level policy making.

Productivity, a core issue in labour market research but applied to contexts of different drivers of shocks, will be relevant in the light of tthe shocks driven by green transition policies. This topic (fig.14, light blue cluster) brings together work looking at competitiveness, labour-markets, education, skills, entrepreneurship, creativity, resilience and unemployment.

Competitiveness of economies and labour markets relies on education at all levels and also for the competitiveness of the overall economy or the employability of individuals in the labour market. Research in this area again highlights the differential effects and competitiveness of advanced economies compared to others. Education systems and the relationship to competitiveness of labour markets are identified as overall indicators of the levels of innovation, potential growth or resilience to exogenous shocks.

There is work drawing out the spatial differences in resilience. Also, differences within a labour market on the impact of external shocks. A noticeable theme highlights how female members of the labour force will experience more negative out-comes as labour markets experience shocks according to spatial differences; female employment typically shows low resilience. Policy options highlighted a move beyond the labour-market to connect into regional infrastructure investment. This remains a key issue – policy integration – to ensure mitigation of the effects on labour markets and downstream effects on communities.

Vocational education and training (VET) has been an essential part of EU policy since the very establishment of the European Community. VET has a key economic function in upskilling and integrating young people into the labour market and in providing high quality technical skills, promoting their talent and strengthening their entrepreneurial skills, all of which produce benefits for the hosting 'labour-market'.

As Fish and McLeod (*Shift Happens*, 2006) put it,

> *"65% of children entering primary school today will end up working in completely new job types that don't exist yet. We are currently preparing students for jobs that don't exist yet.... using technologies that haven't been invented ... in order to solve problems we don't even know are problems yet."* ([15])

Strategies to reduce carbon emissions are set to be a powerful force of economic restructuring, creating new economic opportunities, and also disruption and divestment for some firms and sectors. A pressing issue to ensure just transitions is whether low carbon economic restructuring will challenge or reinforce prevailing geographies of spatial inequality and the labour market.

We conclude from the underlying research that green transition policies must ensure that the new jobs created are 'decent', meaning the inclusion of the consideration of fair

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([15]) Fish & McLeod (2006) Shift Happens

wages, adequate working conditions, sufficient social protection measures, and accessible to the vulnerable and poorest households. Research highlights that labour market flexibility might be produced by a rise in self-employment or employment in the 'gig-economy', both of which are connected to rise in precarious employment and increased chances for individuals to fall into poverty despite being employed, known as in-work poverty. Again, there is a risk highlighted by research that these forms of employment can become concentrated geographically and create precariousness in local economies. The quality of new work is an important research field looking at labour market responses to policy driven shocks.

Entrepreneurship is one of the main competencies for guaranteeing success in the future and in the labour market. What is certain, is that creativity is a value on the rise due to its close relationship with problem solving and entrepreneurship. Creativity and innovation are crucial skills with which to face current challenges in the economy, environment, and social context, and especially in the next decade with the 2030 Agenda for Sustainable Development.

A cross-cutting observation that emerges from the research on unions and corporate social responsibility, through a case study that investigates union influences over corporate social responsibility within the liberal market context is that ([16]) governments are less likely to liberalize if they face a strong union movement. As unemployment becomes more severe, unions' ability to reduce the likelihood of liberalization strongly decreases. Second, trade unions often do not manage to prevent liberalization advanced by social democratic governments. Third, governments can devise three (non-rival) strategies to deflect opposition: (1) they can re-regulate parts of the labour market to protect certain workers from liberalization; (2) generous unemployment benefits can cushion the costs of liberalization, thereby increasing its likelihood; and (3) they can carry out two-tier reforms to insulate insider (unionized) workers employed in permanent contracts, which limits union opposition. ([17])

It is clear from the bibliometric analysis that much of the relevant work on labour markets is examining the impact of shocks on the labour markets and the broader economy and not specifically the green transition. This provides a long running stream of research to draw from and build on. While there is much work on the technological impact on the labour market, climate, and migration shocks to the labour market, which are all relevant, this study has demonstrated that there is little work that addresses specifically the portfolio of policy actions in the green transition.

([16]) OECD (2019), Negotiating Our Way Up: Collective Bargaining in a Changing World of Work, OECD Publishing, Paris, https://doi.org/10.1787/1fd2da34-en

([17]) Vlandas, T & Simoni, M (2020) Labour Market Liberalization and the Rise of Dualism in Europe as the Interplay between Government, Trade Unions and the Economy in Social Policy and Administration (September 2020).

4.   The experts' analysis

4.1. Expert panel analysis

EASSH mobilised a panel of experts to address some of the main research questions, which are a dominating part of the SSH multidisciplinary narratives in the field of the green transition. Experts have referred to their own literature, to ongoing research and the topic areas identified in previous sections and drawn out some previously unidentified key future issues for the transition to a greener economy and employment.

The areas of greatest social impact in this transition have been highlighted as well as the most significant issues for the provision of social services, education and health services. Some attention has been paid to which aspects of the economy and/or society will carry the greater impact (positive/negative) on the transition to a greener way of life as well as the implications for public policy and policy making.

The relative absence of the cultural dimension of labour market responses to the green transition have been identified. For example, in relation to reskilling where local communities, perhaps once home to single dominant industry or job roles, are asked to adapt to the new green transition context. This adaptation has significant impact on their own capacities to keep up with change not just in their jobs but also in their cultural backgrounds and community identity.

This section presents some examples of ongoing and future research, organised in thematic areas. It is not a complete and exhaustive survey of future research questions inherent to the green transition. Although many of the previously identified themes remain relevant, this section attempts to address the obvious gaps in previous work and look beyond the focus on the economy and the market, by shifting attention to social transformation alongside employment and labour.

4.2. Socio-economic aspects of green transition

This section considers some of the new or ongoing dimensions of research in this area:

- Impact of green policy measures, from a SSH perspective, on social transformation;

- Models for participative policy making about green transition;

- Green transition narratives and communication;

- Green transition impact on professional identity.

One dimension of the green transition identified by policy makers is the movement towards the concept of the 'circular economy' (CE). The CE has been mainly approached from the perspective of the environment. However, the transition to a circular economy will have social consequences. What will these be and how will they be managed?

Traditionally, research has focused on the 'company' as the hero in shaping/reshaping the market. However, the transition to a CE requires a focus on other important actors and on their engagement in this transition. For example:

- The role of the university in the transition to CE

- Engaging customers in CE: consumers are the unique deciders of the value of any offer. How could consumers be engaged in new sustainability/ circular economy initiatives?

- The transition to CE requires redesigning products, services, and systems. How could designers be better engaged in this transition?

- More importantly, the impact of CE on skills development, new expertise and new work profiles emerging to implement all the phases of CE.

- The micro-foundation of the transition to CE: from an ecosystem perspective, what are the micro-foundations and mechanisms that could help to foster the transition to CE? How do they interact?

- Institutional change: society functions based on a set of institutions. Thus, it could be interesting to address how new institutions that are underpinned by sustainability could be fostered, e.g., low consumerism versus high consumption; embracing sustainable fashion (e.g., second hand clothes) versus fast fashion.

- Industrial relations: the transformation of business ecosystems towards green economy/circular economy/sustainability: how does the transformation occur and what tools are needed?

- The cultural and creative sector: the sector is alert to the need to adopt practices for environmental and economic sustainability; cultural institutions are re-thinking their role in society and the economy. How can the cultural sector contribute more effectively to facilitating the green transition?

- The role of the citizen as an important stakeholder in research as evidenced in citizen science, participatory monitoring and public engagement. More re-search is needed on the role and relevance of citizen engagement in green transition projects.

4.3. Green transition as a driver of social transformation

The transition of European societies towards carbon neutrality (and towards less environmental impact in other domains such as biodiversity) requires substantial changes in the economies, but also the lifestyles of citizens. Transitions as substantial as this will have significant effects on people's lives (with respect to both their economy and their well-being, identity, physiological and psychological health).

Current research identified by the panel highlights challenges and drivers for the transition on the individual, the group, and the institutional level. This work suggests four main policy recommendations:

- The reduction of the regulatory, legal, and procedural burdens for joining low energy programs so that the barriers for consumers (especially vulnerable consumers) are reduced.

- Energy programs need to have inbuilt data collection tools and key performance indicators measuring their effects (including social effects) and this information needs to be accessible to actors.

- Policies need to be targeted to specific collectives and groups as their needs and characteristics are different. Emotional reactions, social identity, and place attachment are important factors of concern ([18]).

- New indicators of the social effects of policy changes, among them energy poverty. A comparison of the extensive literature review ([19]) and the analysis of policy strategy documents showed that the full wealth of scientific knowledge from social sciences has not yet been unlocked in policy design, which so far has mostly focussed on providing information and economic incentives to citizens. ([20])

There is space for research to look at promoting bottom-up social innovation processes in the energy sector (interpreted broadly) and taking into account issues such as:

- Mobility planning, tourism and city dwellers;

- Energy autonomy with regenerative energy on islands;

- Superblocks as an instrument in city planning;

- Innovative instruments targeting energy poverty;

- District regeneration with a focus on combining reviving vulnerable communities and energy efficiency.

Energy poverty is a major challenge. Tackling this challenge should involve the close co-design by residents and communities of policies to implement the green transition.

There is positive potential in combining energy transition with a focus on social improvements ([21]). Bottom-up initiatives have a positive effect on energy equality and energy justice compared to the implementation of policy not involving citizens to the same degree. This work speaks to the need to incorporate the differential effects on communities and groups of the implementation of policies as highlighted in the bibliometric analysis in section two. Work to build on existing projects will need to study the social consequences of the energy transition across the EU. Research has identified

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([18]) Klöckner, C.A (et al.), (2019), ECHOES Report. Policy ready recommendations D7.3 https://echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/D7.3.pdf).

([19]) Schwarzinger, S. (et al.), (2017), *ECHOES Report. Social Science Perspectives on Electric Mobility, Smart Energy Technologies, and Energy Use in Buildings – A comprehensive Literature Review*, D3.1 https://echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/D3.1.pdf

([20]) *An Analysis of the Potential of Advanced Social Science Knowledge in Policymaking* https://echoes-project.eu/sites/echoes.drupal.pulsartecnalia.com/files/D%203.3%20final.pdf

([21]) A. Krummab, D. Süsserc, P. Blechinge (2022) *Modelling social aspects of the energy transition: What is the current representation of social factors in energy models* in Energy Volume 239, Part A, 15 January 2022, 121706 https://www.sciencedirect.com/science/article/abs/pii/S036054442101954X

five dimensions: socio-economic, socio-ecological and technical, socio-cultural, socio-political, and socio-psychological.

The stress experienced goes far beyond economic challenges, it also includes a threat to people's professional and regional identity, a threat to their attachment to place and their ability to take responsibility for their lives. Measures to empower local actors not only to deal with economic challenges but also with a disruption of their local societies and social structures are important.

Several projects focus on energy efficiency and green transition interventions in private households. They are still ongoing, but what can be concluded already is that interventions in households hold a potential for substantial changes in lifestyles, energy and resource use, but also show the difficulty of upscaling successful intervention strategies from the lab to the real world.

5. Recommendations

In discussions to date on policy relating to the sustainability transition, the social dimension is not explicitly addressed or is understood in a very narrow way in terms of employment.

We recommend that ongoing research in the major labour market research themes should be undertaken with specific reference to the portfolio of green transition policies, to build on the body of labour market research which examines other drivers of shocks.

In order to understand the relationship between the green transition, social transformation and labour market we recommend that research under Horizon Europe should be drawn from a range of perspectives and a balance of methodological approaches. This issue deserves as much prominence as the selection of topics of the research. The previous work we identified has rarely used both qualitative and quantitative methods; a greater depth of understanding of the effects and circumstances of green transition on different communities could be produced with methodological diversity.

5.1. Labour Market; education, skills and attributes (soft-skills) and differential impacts on labour markets

It is important to ensure that a spread of research work is supported to examine the differential effects of the policies underpinning the green transition, across different countries and regions of the EU. We make the following recommendations:

- Attention is paid to research themes in the work programme looking at differential impacts on business/industrial sectors and effects on the related part of the labour market. In particular, the importance of supporting locally focussed social/community case study research to draw out local experience and to understand the nature of the impact of job loss and changes beyond the financial impact. What are the cultural effects, how are communities' identities disrupted? What does transition to a fluid career pathway suggest for individual identity.

- Continuing to support research looking at resilience capacity to the effects of shocks on labour markets, across different regions of Europe with varying root causes, paying particular attention to education: mainstream, Higher Ed-ucation, vocational and life-long learning. Supported research should also ex-amine the place of soft-skill attributes required of the labour force such as entrepreneurship, creativity or problem solving.

- Further research is required to examine individuals' behaviours, and a lack of responses to the changes brought about by impact on the labour market thanks to green transition policies. Also, how to ensure that education and skills policy initiatives are effective.

- Population, regional and global migration studies to understand the dynamics of change in a single/local labour market context compared to large national contexts.

5.2. Labour market changes and the impact on culture and identity

The analysis of H2020 projects and academic publications reveals that there is a near absence of research that looks at the impacts of labour market changes on culture or identity. We recommend:

- That an appropriate balance between economics-based perspectives and humanities perspectives is funded.

- That the design of Work programmes under Horizon Europe includes a historical dimension to ensure that future research captures the historical perspective of the effects of changes on culture and identity in order to better understand the cultural impacts of green transition.

- That there should be – for the first time - research on literature, practice-based research in arts, drama and performance studies, to contribute to the understanding of concepts such as resilience, the Anthropocene, and the nature-culture continuum, for the function they play in building social consciousness and shaping the socio-cultural imagination.

- Legal studies should be encouraged more systematically in the research funding as these are key to understanding the interplay of green transition policies, the integration of new legislative and regulatory frameworks and the impacts on labour markets.

6. List of abbreviations

LDA: Latent Dirichlet Allocation

MCA: Multiple Correspondence Analysis

SDG: Sustainable Development Goals

SSH: Social Sciences and Humanities

R&I: Research and Innovation

VET: Vocational education and training (VET)

WoS: Web of Science

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Annex 2. Additional figures for the bibliometric analysis

Figure 17: Adaptation

Figure 18: Climate Change

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