UNIVERSITAT DE BARCELONA

Campus de l'Alimentació
Universitat de Barcelona

BACHELOR'S THESIS (TFG)

DEPARTAMENT DE MEDICINA

JUNE 2020

Towards a new healthy and sustainable food model

TRANSITION OF FOOD POLICIES: FROM "C40 TO BARCELONA"

Bibliographic Research

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ABSTRACT

The concern for sustainability has risen in recent years because of the harmful consequences we are suffering. Although vegetarian dietary patterns have been widely adopted in order to mitigate the environmental footprint, the possibility for other diets to have similar outcomes has been highly discussed. The transition of the food system model towards a healthier and more sustainable one is urgently necessary and while meeting the committed goals of COP21 and 2030 Agenda is still possible. An integrative and multi-sectorial approach will be efficient if the established actions tackle issues across the food supply chain at all levels, from food production to food consumption. At the consumption extent, feeding the 2050 expected population is possible if a healthy and sustainable diet (omnivorous dietary patterns with very limited animal source content) is implemented globally with scope for adaptation to regional culture and preferences. Aligned with this mission, Barcelona is a pioneer city in the national context by being committed to international organizations, such as C40 Cities, to reduce their impact on climate change and apply measures based on strong and high-quality evidence such as a reduction of red meat in school canteens.

RESUM

L'empitjorament del canvi climàtic en la última dècada ha fet que la preocupació per la sostenibilitat s'hagi convertit en un tema emergent essent la implementació d'una dieta vegetariana, una de les modificacions més comunes. Tot i així, estudis recents corroboren que no és necessari eliminar les fonts d'origen animal per aconseguir un impacte mediambiental similar al de les dietes vegetarianes. Tanmateix, la transició cap a un sistema alimentari més saludable i respectuós amb el planeta s'ha de realitzar amb urgència ja que encara és possible assolir els objectius fixats pel COP21 i l'Agenda 2030. El nou sistema ha de destacar per la integritat entre els diferents sectors i és per això que les accions requerides per tal que el procés sigui eficaç han d'estar adreçades a tots als fases de la cadena alimentària des de la producció fins a la distribució. Serà possible alimentar la població mundial estimada al 2050 si s'adopta una dieta omnívora modificada (amb un contingut molt reduït de productes d'origen animal) que a part de ser saludable també és respectuosa amb el planeta.

Barcelona ha estat pionera, en aquesta mateixa línia, a nivell nacional pel seu compromís amb diverses organitzacions mundials, com és la C40 Cities o amb els objectius de les Nacions Unides, per tal de reduir la seva petjada ecològica. Això s'ha aconseguit a través de la implementació de diverses normatives, basades en evidència científica d'alta qualitat d'entre les quals destaca la reducció de la carn vermella als menjadors escolars.

KEYWORDS

Sustainability, Diet, Nutrition, Food Systems, Food Policies.

ABBREVIATIONS

GHG- Greenhouse gas
IPPC- Intergovernmental Panel on Climate Change
FAO- Food and Agriculture Organization
UN- United Nations
WHO- World Health Organization
UNCED- United Nations Conference on Environment and Development
UNFCCC- United Nations Framework Convention on Climate Change
COP-Conference of the Parties
SDG- Sustainable Development Goals
IPCC- The Intergovernmental Panel on Climate Change
IPBES- The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem services
EC- European Commission
CAP- Common Agriculture Policy
CoR- European Committee of the Regions
ASPB- Agència de Salut Pública de Barcelona [Catalan Public Health Agency]

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1. Introduction

The emerging trends have redirected the focus of social, economic and cultural interests, towards achieving sustainability. The current aim is to decelerate the global warming process by different means such as modifying dietary patterns, changing policies and many others.

Although I consider my bachelor to have provided me with a great source of information and various capabilities that allow me to have a critical view, I still believe my academic knowledge is too centered on the scientific approach. During all these years, I lacked an integrative understanding of the social, economic and cultural determinants implicated in food systems and the nexus between these. There was also a particular aspect that had not been examined in my classes before, maybe because of insufficient data or deficient awareness, we never covered any facets of it, the concern for sustainability. Yet it is true that is one of the emerging trends of the last few years, as I mentioned before, my empathy towards that interest had started a long time ago.

Greenhouse Gas (GHG) Emissions

By GHG we refer to all gases (i.e. water vapour, carbon dioxide, methane or others) that absorb and emit radiant energy within the range of thermal infrared (1). It is due to these gases that in our planet we find the phenomena of **greenhouse effect** which is mainly contributing to the rising of the Earth's surface temperature. Taking this definition into account, it is clear that such emissions are challenging not only for the survival of the human species but to all fauna and flora inhabiting the Earth. The Intergovernmental Panel on Climate Change (IPCC) described it as if we have an ultimatum to reverse the destructive impact of our actions (*Figure 1)* (2).

In agreement to such theory, Professor Willet from Harvard University said that "humanity is facing a huge crisis in terms of environment, health and well-being" (3). Across the globe, nutritional concern for undernutrition has diminished, though still significant, due to an obesity and overweight epidemic. As it will be mentioned later, The Lancet Commission published *The Global Syndemic* report that identified the three pandemics threatening today's world population: obesity, undernutrition and climate change (4).

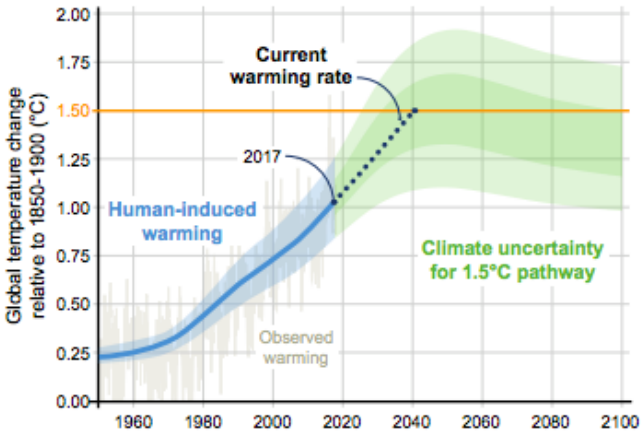

Figure 1. *Human-induced warming reached approximately 1ºC above pre-industrial levels in 2017 (20).*

Food Systems

In order to further discuss the challenges that the food system is facing, the concept must be defined. In a paper published by the Food and Agriculture Organization (FAO), the food system concept referred to all activities and individuals involved in some stage of the food production, distribution, consumption and disposition as well as considering the economic, cultural and natural context (5). Furthermore, it is also stated that the complexity around the food system is due to the overlapping with other processes such as the economic or health system. Due to this, it is clear to me that modifications of the actual food system model compromise the economic structure of a country by destabilizing some key systems. Moreover, the Oxford University Centre for the Environment included "other determinants of food security" as part of a broader definition of food systems (6).

Food System Challenges

From my perspective, clearly the problem around the real food model is due to both the food production and consumption. The first one "accounts for between a quarter and a third of GHG emissions" (2). Considering this statement, I believe that the approach that must be applied is not only towards achieving "conscious consumers" as well as providing a food system that is both compatible with our culinary and agricultural traditions while meeting the sustainable objectives. Such measures will have to be accurately revised and studied so the information provided is clear and unequivocal. In this way, society will be less likely to reject the proposal.

It should be noted that the food system is very diversified meaning that the relationship between food production and consumption is distant thus, consumers are not totally conscious of their implication in the supply chain. Additionally, the natural reaction against change is fear and rejection and so, when the system needs to be modified people will dislike it. Although the problems are not only due to society's fear but conflict of interest between the government and food production companies as well. Because of these reasons, the implementation of an innovative approach that considers all these issues is urgently needed.

Considering the food consumption within the food system, the population's diet has a strong and direct impact on food production and the environment. When carefully studying the effect of different dietary patterns on the planet, it has been seen in various studies that a healthy vegan diet (with very low processed plant-based meats) is the most sustainable diet in terms of environmental footprint (GHG emissions, water impact and land use). However, it has also been suggested in these reports that the same outcomes could be achieved through an alternative omnivorous diet consisting of significantly reduced amounts of animal sources (7-10).

Barcelona's Case Study

From my point of view, the key seems to focus on the development of a city concept where awareness is risen between the population and the companies, so they are involved in all stages of the food supply chain. This approach has been applied by C40 Cities initiative in the world's biggest cities, such as London, to reduce their environmental impact. This perspective will be further discussed along this paper. Indeed, in 2019 the city of Barcelona after declaring their climate emergency started implementing measures around the city in order to achieve the goals they committed to (2). Changes apply to all levels of the supply chain from promoting local production to decreasing red meat in school canteens. Initiatives that are being considered by Barcelona's City Council are local, agri-ecological production; increasing the supply of and access to local, ecological fresh products; reducing the consumption of animal protein and highly processed foods and offer everyone the tools to facilitate the transition to a healthier and more sustainable lifestyle (2). Amongst all these measures and regarding the background of this thesis, the subject will focus on this transition.

2. Objectives/Hypothesis

As mentioned previously, seen that maintaining an omnivorous diet while having a low environmental effect is possible:

- The main objective of this thesis is to analyse the international political strategies that have supported the basis for the transition towards a healthier and more sustainable model of both food production and consumption, and the impact of these policies at the local level.
- Furthermore, with that basis, understanding how there is no need to adopt neither a vegan nor vegetarian diet to meet the committed goals set by COP21 and 2030 Agenda. The purpose of this paper is not to convince the reader of whether they should be considering to undertake a vegan/vegetarian dietary pattern but to inform that to stop the disastrous effects of climate change, limiting the intake of animal sources is enough.
- Highlight how the change in food policy in the city of Barcelona is supported by high-strong quality evidence and policies.
- Furthermore, the purpose of the project is also extended to understanding the basis behind the decision of reducing red meat in schools' canteens.

3. Methods

The reason behind the focus of this project is due to a process of research that started a long time before commencing to write. The interest of studying the impact of climate change on food systems was clear to me since the very beginning. However, the topic itself was very discussed thus providing both complex and an excessive amount of information thus, in order to redirect my work, I looked for key points through scientific research and food policies. I consider it is important to mention this part of the methodology because it was the starting point of the paper.

The first part of my research was based on Pubmed, a bibliographic database. The search, conducted in English, with the terms being introduced being the following ones ("climate change" AND nutrition) and since the interest in the subject is increasing significantly since 2012 reaching the highest results per year in 2019. I applied the data of publication filter (published articles between 2019 and 2020) and document type filter (reviews since I wanted recent articles that were analysing both recent and past studies and to get an idea of the subject) and obtained 58 results. Sorted by best match, 10 articles were found in the first page and by reading their title I could choose whether they were appropriate or not based on the topics they were focused on and where they were published. I also used the suggested articles tab in Pubmed after noticing an interesting study and after reading articles if I found thought-provoking quotes, I would look for the original article.

In late January 2020, el Periódico reported the red meat reduction in school canteens, this was crucial for the development of the project since it was at that point that I decided to predicate my paper on that food policy decision and the basis behind it (11). Therefore, from then on, my investigation was found on the Barcelona City Council webpage and from every new information I was learning, more institutions, agreements, conferences were rising. Thus, clearly, my thesis is not fully a bibliographic research but more like a historical analysis of how policies have adopted the concern for both sustainability and healthy dietary patterns. My assessment was based mostly in reading Agreements, Summary Reports, Presentations, Conferences and Studies made by international and regional organizations.

Later, I used again Pubmed to focus on a different search (vegan AND sustainability) while applying the filters of data of publication (articles published within the last five years) and analysed the articles according to the quality of their evidence prioritizing systematic reviews and randomized control trials.

Finally, as to what concerns the thesis structure, the project has mainly two body texts divided by an approximative timeline defined by the Barcelona's climate emergency declaration. Therefore, the first part of the discussion considers all significant events occurred before 2019 and the second chapter refers to posterior in date.

4. Antecedents

Global Overview

Food in the Anthropocene, a report that will be discussed with more detail later on, analysed several critical situations that throughout history compromised the health of certain populations (12). It mentions the actions that took place in order to address such problems and prevent them from reoccurring on a future. For example, between the 1920s and 1930s there was a massive global crisis in the food supply chain that caused hunger and inequality. Furthermore, the study underlines that is during periods of cataclysm and wars that the first issue to resurface is starvation and malnutrition although crisis are also an opportunity for a change and a reorientation of the food system itself. The report remarks that even though all food systems will be affected under that specific situation there are possible ways to mitigate the effect of such tragedy. A good example is a society that is more involved and where social awareness is promoted in conjunction with a sustainable food system. In my opinion, this exposes how, yet it is correct that global transformation takes a lot of effort and it is complicated, it is possible.

After the Second World War it was clear that in order to reconstruct Europe, measures focused on agriculture were to be taken. As Karl Brandt wrote in his book *The Reconstruction of World Agriculture*: "Policies of reconstruction for agriculture or industry drawn up wholly in terms of national autonomy and sovereignty could lay the foundations for an entrenched economic nationalism" (13).

Considering these references, we can conclude that was a crucial situation in which the food system was redirected and achieved such change. This is an interesting point for the basis of the theory that will be discussed across the paper.

United Nations (UN)

Back in June of 1945, a conference took place in San Francisco attended by members of 50 different countries who signed a charter and thus, the United Nations and other organizations were established: "It was during the early part of the post-war reconstruction period that FAO was brought into being" (14). Furthermore "when diplomats met in San Francisco to form the United Nations in 1945, one of the things they discussed was setting up a global health organization" and 3 years after that, in 1948 the World Health Organization (WHO) was created to tackle global issues with the mindset that "WHO's top priorities would be malaria, women's and children's health, tuberculosis, venereal disease, nutrition and environmental sanitation" (11,12).

The Earth Summit or United Nations Conference on Environment and Development (UNCED) also referred as the United Nations Framework Convention on Climate Change

(UNFCCC) refers to the conference in Rio in 1992 that defined protocols for climate change-related issues that needed to be addressed on a major extent (15).
I believe the UNCED/UNFCCC is of great significance since it symbolizes the penetration of **climate change-related issues** as a topic to be discussed at the global level as a priority issue.

> The Conference of the Parties (COP) is the supreme decision-making body of the Convention. All States that are Parties to the Convention are represented at the COP, at which they review the application of the convention and any other legal instruments that the COP adopts and take decisions necessary to promote the effective implementation of the Convention, including institutional and administrative arrangements. (16)

In 1995, Germany convoked the first COP meeting, COP1, in their capital, Berlin, and since then, COP gatherings have been held once a year and named by numbers as they have occurred (16).
The Kyoto Protocol, COP3, took place in Japan in 1997 and it was one of the most important COPs because with the objective of reducing GHG emissions, specific policies were stipulated. The Kyoto Protocol "operationalizes the UNFCCC by committing industrialized countries to limit and decrease greenhouse gases (GHG) emissions in accordance with agreed individual targets" (17). In the Conference, it was defined that national policies and periodical measures had to be developed in order to achieve such targets.

The year 2015 "was a landmark year for multilateralism and international policy shaping, with the adoption of several major agreements" amongst them: Addis Ababa Action Agenda on Financing for Development, the maturing of the 2030 Agenda for Sustainable Development and the Paris Agreement on Climate Change also known as the COP21 (18). In my opinion, such agreements are key for the development of new policies, contributing to shift the global reference focus and set a new starting point towards a progressive change.

The Paris Agreement or COP21, hosted in Paris in December 2015, aimed to discuss climate change effects and how to address the issue: "The Paris Agreement set out to improve upon and replace the Kyoto Protocol, an earlier international treaty designed to curb the release of greenhouse gases." (19). Furthermore, it "sets out a global framework to avoid dangerous climate change by limiting global warming to well below 2 ºC and pursuing efforts to limit it to 1.5 °C" (20).
I am convinced that it is indeed vital to mention such conference because of what all subsequent policies have in common: the target to achieve the 1.5-degree goals (relative to 1861–1880 temperatures) established in COP21. A good example is the Barcelona case

study since in order to meet the COP21 objectives, they declared the climate emergency state along with the application of multifarious initiatives (2). Even though some people may consider the implementation of such campaign to be quite unrealistic or harsh, in my opinion, I think otherwise since we are already facing some harmful consequences due to climate change.

In July 2019, the Secretary General of the UN asked the Chilean Government to lead the coalition "Mitigation Strategy" of the Climate Action Summit that took place in September in New York (21). In line with the Paris Agreement, this coalition's aim was to gather as many nations and organizations as possible in order to meet the set 1.5-degree goals. Lastly, in December 2019 Spain hold COP25 with **climate change** as the main focus of the conference and Spain also joined the Climate Action Summit (22). Members of such initiative (102 cities and 65 countries around the globe, including the European Union) are dedicated to develop tactics to achieve carbon neutral emissions by 2050, as a long-term objective to reach the climate neutrality according to the Paris Agreement. Some of the actions that have been launched by the Climate Action Summit are: "Carbon Neutrality Coalition", "Business Ambition for 1.5˚C - Our Only Future" or "Deadline 2020" (22).
As far as I am concerned, Spain's Climate Action Summit membership commits Barcelona to follow and develop strategies to achieve these goals.

The 2030 Agenda for Sustainable Development and the Sustainable Development Goals

It came to a point, climate change had affected all countries around the world thus, the global partnership of the UN member states started developing attainable objectives and strategies to approach the issues. The UN Sustainable Development Summit that occurred in September 2015 in New York City, defined 17 Sustainable Development Goals (SDGs) (*Figure 2*) that were the core of the 2030 Agenda for Sustainable Development (18). "Given the disproportionate effect of food systems on human health and environmental sustainability, these global agendas provide an unprecedented opportunity for catalysing the change in thinking that will be necessary to transform the global food system" (12).

Figure 2. *Sustainable Development Goals (18).*

Most UN SDGs are related to the effect of climate change in food systems and nutrition. Following is highlighted this nexus:

- 2nd SDG: **Zero Hunger**. The mission is to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" (18).
- 3rd SDG: **Good Health and Well-being**. Indirectly, eating habits determine the health and well-being of an individual.
- 11th SDG: **Sustainable Cities and Communities**. Aligned with the objective in mind to "make cities and human settlements inclusive, safe, resilient and sustainable" (18). As I mentioned before and I will further discuss, I hold the view that the key for growing a conscious society that not only understands their own position in both the processes of consumption and production but also tries to ameliorate it and is more open to change, is to make the population participants of the process.
- 12th SDG: **Responsible Consumption and Production**. By ensuring the 11th SDG, the application of sustainable consumption and production patterns is much easier to be implemented.
- 13th SDG: **Climate Action**. Based on the idea that the development of the SDGs was to tackle climate change, it is clear that climate action is both an SDG and inherent in all the other ones.
- 17th SDG: **Partnership for the Goals**. I consider this to be one of the most important objectives since the issues are spread widely across the planet. If addressing them individually, the system itself will be more likely to not be maintained. However, if the means of implementation are strengthened and the global partnership for sustainable progression is invigorated, change will be likely to be sustained.

It goes without saying that after the Paris Agreement, the SDGs from the 2030 Agenda are fundamental for countries to know how to tackle the problem and achieve COP21 targets.

The Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem

It is important to understand that well-known global institutions such as WHO and UN have scientific committees to provide the basis for resolutions for the days to come. On the one hand, to make decisions, the UN is advised by a corporation called the Intergovernmental Panel on Climate Change (IPCC). IPCC was created to "provide policy-makers with regular scientific assessments on climate change, its implications and potential future risks, as well as to put forward adaptation and mitigation options" (23). The role of the panel is to identify the topics related to climate change in which there is a common agreement between the scientific board and promote further investigations in inconclusive situations. Therefore, by offering highly qualified and strong evidence, the IPCC permits the UN to decide and propose policies and deliberations that are based on the best experimental knowledge.

> The IPCC has set scientific targets for climate, defining a spectrum of maximum carbon dioxide emissions allowed to continue to be within different levels of average global temperature rise. These emission targets have provided estimates of remaining carbon budgets and climate risks for societies, which have formed the basis for the Paris Agreement. (12)

In the *Climate Change and Land* Report of the IPCC, it is clearly exposed how climate change influences a wide range of major issues (24). Amongst these problems, nutrition and food security are strongly affected thus, repeatedly discussed in the report. It remarks that "risks related to food security are greater in pathways with lower income, increased food demand, increased food prices resulting from competition for land, more limited trade, and other challenges to adaptation" (24). As it is mentioned, when deciding the approach for future measures, the focus should be on topics that have shown high confidence and a solid scientific basis. This IPCC study defines with a high confidence that:

> Policies promoting the target of land degradation neutrality can also support food security, human well-being and climate change adaptation and mitigation. […] Policies that operate across the food system, including those that reduce food loss and waste and influence dietary choices, enable more sustainable land-use management, enhanced food security and low emissions trajectories. (24)

Lastly, the article also remarks that the evidence shows with a high confidence that "near-term action to address climate change adaptation and mitigation, desertification, land degradation and food security can bring social, ecological, economic and development co-benefits" (24).

On the other hand, the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem (IPBES) is not a UN institution but 'an independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development" (25).

The World Wildlife Fund published a summary in December 2019 of both IPCC and IPBES reports concerning climate change and the future 1.5 ºC set goals (26). In this synthesis, an integrative global understanding of the climate change process is developed showing how both nature and humanity affect each other, "limiting global warming to 1.5 °C is essential, and nature needs protection more than ever". It is also mentioned how the systemic shift that should take place has to be based on four main characteristics:

- Urgency: delayed-action increases both the costs and risks.
- Universality: an integrative approach that addresses all systems.
- Synergy: prioritizing in order to achieve a win-win situation.
- Adaptability: development of strategies that are flexible and resilient.

Both the IPCC and IPBES "constantly champion narrowing the gap between scientific evidence and policy making" and "continually collect high-quality data and are subject to intergovernmental agreements, conventions, and Conferences of the Parties" (12). To my eyes, such organizations are indispensable to provide us with the best possible information so policies and measures applied are safe and efficient.

European Overview

European Commission (EC)

In January 2000, the Commission of the European Communities published the *White Paper on Food Safety* (27). The report is well known for the "farm to fork" policy principle that basically comprises the other principles in order to prioritize food safety across all the supply chain. In order to achieve such objective, an integrated, traceable, effective and transparent system must be implemented.

In March 2017, the *White Paper on the Future of Europe* was released by the EC with the future proposals for 2025 in which it is stated that "the EU27 manages to positively shape the global agenda in a number of fields such as climate, financial stability and sustainable development" (28).

As previously stated, climate change has had huge impact on the global scale. At the European level, the EC claims: "in summer 2018, Europe faced extreme climatic conditions with serious impacts for producers. For instance, the drought that hit Europe led to a significant drop of total EU cereal production, estimated at 8% below the last five-year average." (29). The EC also remarks that agriculture has been damaged in a way that both quantity and quality (protein content in wheat) of the final product have been threatened. Still on the subject, due to the crisis Europe is facing, the EU has tried to support farmers and agriculture to mitigate the damage caused. European policies have been adapted to new conditions to reduce the environmental impact and try to find a symbiotic relationship between humanity and the environment: "Since 1990, for example, there has been a 23% reduction in agricultural non-CO^2 greenhouse gas emissions, while the level of EU organic farming across the EU has risen by 5.5% every year for the last ten years." (29). Such improvements towards a more sustainable agri-food system has been possible due to a modification of the Common Agriculture Policy (CAP) focus.

In June 2018, the EC applied legislative measures for the future of the CAP because of their commitment to achieve the COP21 objective and SDGs (29). The proposal included the development of a new system to support economically eco-friendly farming practices; eco-schemes to achieve further goals than the ones established; investing at least 30% of rural development budget for environment and climate and redirecting 40% of the overall budget to decelerate climate change. "These ambitious objectives will be achieved through a new delivery system, providing greater flexibility for Member States and farmers and ensuring greater effectiveness. It allows to better target and design climate objectives in line with local needs." (29).

I consider the *White Paper* as one of the most important documents of the EC because of the EU's intention to prioritize food safety as their policy. Furthermore, to my mind, CAP modifications are interesting to highlight since this supports the agricultural changes in Barcelona that will be discussed to improve the current food system.

5. State of Art

Global Overview

The first chapter of this disease was focused on the penetration of climate change-related issues in food policies at the global level. Furthermore, this part of the project will analyse how climate change affects have shaped current food policies and what future initiatives look like. With the establishment of a theoretical timeline that separates both chapters, Barcelona's climate emergency declaration.

EAT

EAT is a non-profit organization founded in Stockholm with the intention of catalysing a food system transformation (30). Since the very beginning of the EAT creation, it has been repeatedly mentioned that a Great Food Transformation is needed to reduce climate change impacts. This process "Of the global food system should ultimately involve multiple stakeholders, from individual consumers to policy-makers and all actors in the food supply chain, working together towards the shared global goal of healthy and sustainable diets for all" (12). EAT's mission is to promote a transition of today's food systems towards a healthier and more sustainable future through strong partnership and cross-country cooperation based on high-quality scientific evidence (30). Thus, EAT works along with a wide number of institutions and professionals involved in the food system, all sectors related to either food production or consumption. As stated, they follow an interdisciplinary approach "across science, policy, business and civil society" in order to achieve five transformations by 2050 (30):

1. A transition towards healthier and more sustainable diets
2. Align the priorities of the food system towards the interest in people and the planet
3. Produce healthier and sustainable foods
4. Protect land and oceans
5. Reduce radically food waste and loss

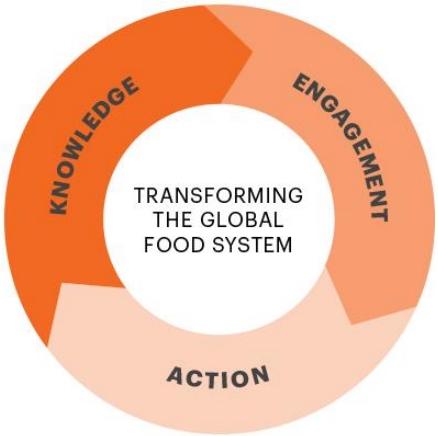

Figure 3. *How EAT works (30).*

EAT has become a renowned organization. Working across different disciplines gives the institution a characteristic approach to the situation while considering the other many factors associated with food (30). They have addressed challenges through a three-way fusion of science, policy and business (*Figure 3*):

a. Science (knowledge): As to what concerns to science, EAT has developed the EAT-Lancet Commission that provides extensive scientific research in order to share trustworthy and valuable knowledge.
b. Policy (engagement): Secondly, after having understood the direction which should be followed the engagement is based on defining the short or long-term objective.
c. Business (action): Lastly, partnership between governments, institutions and organizations is crucial for action.

EAT has proposed a "10-point plan" for the 2017–2020 period so the food transformation can take place. An adapted diagram is provided below (*Figure 4*) in order to comprehend the action plan.

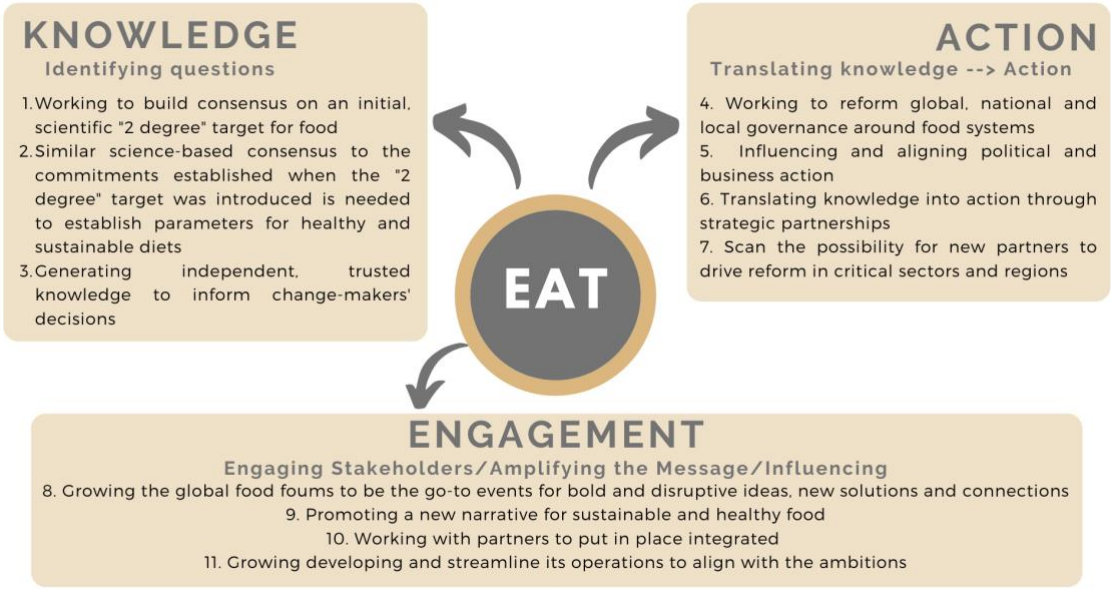

Figure 4*. Adaptation of EAT's 10-point plan (30).*

My own feeling on the subject is that organizations like this should not only be recognized because of their work but widely known by society. I find EAT's approach to be very interesting and efficient because beyond nutritional aspects, the cultural, economic, social and psychological dimension related to food should be considered when examining the issue.

To raise public awareness, EAT has created a few initiatives addressed to certain population groups: actions for children and youth such as CHEW; actions for countries, cities and business and chefs (30). EAT Cities' purpose is to interpret the results of the studies completed by the EAT-Lancet Commission into a practical efficient strategy. Included partnerships in the EAT Cities are EAT-C40 known as The Food Systems

Network, more on that later on the paper, and Shifting Urban Diets. This last one developed by the EAT-Lancet Commission together with the city of Copenhagen in April 2019 to translate the empirical outcomes in a pragmatic approach to real interventions and local actions around the city.

> The objective of 'Operationalizing Food System Targets for Health and Sustainability' is to enable cities to set smarter and more ambitious food system targets with greater accountability and measurable benefits to climate, environment, public health, and societal well-being. […] With this work, Copenhagen is one of the first cities to put global consensus on the food system for sustainability, climate and health into action. The aim is to scale and replicate the job in other city contexts as well. (30)

I have a strong conviction this kind of initiatives are the type of projects that will lead to bigger changes and thanks to model examples like Copenhagen, application of similar measures in other cities will be possible.

The EAT-Lancet Commission on Food, Planet, Health

Due to a lack of scientific reports about healthy sustainable diets, the EAT-Lancet Commission was created (30). The Commission consists of 37 world-leading scientists from all over the globe:

> To respond the question: Can we feed a future population of 10 billion people a healthy diet within planetary boundaries? The answer is yes, but it will be impossible without transforming eating habits, improving food production and reducing food waste. (30)

The Commission is "using the latest available science to make a global assessment of the food system and set global scientific targets for healthy diets and sustainable food production" and differs from the other Lancet Commissions because of their distinctive focus between "diet, human health, and environmental sustainability" (12). I hold the view that the unique multicultural and multidisciplinary approach of the Commission has excelled their work on a universal basis.

The EAT-Lancet Commission published the *Food in the Anthropocene* report, discussed below, with the objective to (30):

- Define a healthy reference diet with the best available evidence.
- Define planetary boundaries
- Apply a global food system modelling framework to see if this healthy reference diet could fit within the constraints of what our planet can support.
- Outline strategies of how to achieve such goals

EAT-Lancet report: *Food in the Anthropocene: the EAT-Lancet Commission on healthy diets from sustainable food systems*

The *Food in the Anthropocene* EAT-Lancet Report, published on 16 January 2019, "is the first full scientific review of what constitutes a healthy diet from a sustainable food system, and which actions can support and speed up food system transformation" (30). Outcomes of such study intend to provide efficient and pragmatic information about the direction in which transition of food systems should focus on, to achieve the set goals and offer an answer to the question mentioned before, "Can we feed a future population of 10 billion people a healthy diet within planetary boundaries?" (30).

Three days after publishing the paper, the EAT-Lancet Launch Lecture hold in Oslo, led by Professor Willet from Harvard University and Professor Rockström from the Potsdam Institute and Stockholm Resilience Centre in order to expose the impressive results of the report (3). Details of the presentation are discussed below.

In the event, Rockström remarked that "food is the single largest contributor towards escalating environmental pressure and therefore we need to take an earth system approach to defining sustainable food systems" and specifically distinguished their report because of (3):

> The unique feature of this first ever scientific assessment is that we got the medical scholars to work together with the sustainability scholars for the first time advancing an integrative, universal framework to quantify healthy diets and sustainable food systems. (3)

During the Launch Lecture, they proceeded to explain the main points of the reviewed studies. It was specially remarked the structure followed for the investigation with the definition of one goal tackled by two targets addressed through five different strategies.

- **One goal**: as previously stated, the objective was to answer the question of whether feeding the 2050 population is feasible.

- **Two scientific targets**: "The scientific targets for healthy diets and sustainable food systems are integrated into a common framework, the safe operating space for food systems, so that win-win diets (both healthy and environmentally sustainable) can be identified" (12).

1. **Healthy Diets.** As Willet mentioned "Almost all countries are low in fish, vegetables, fruit, legumes, whole grains and nuts" therefore a change is necessary (3).
    - Looking for the best available evidence: choosing randomized controlled feeding studies, observational cohort studies and randomized trials
    - "Finding a diet that was not restrictive diet but inspirational" (3)

In this target, three different approaches (comparative risk, global burden of disease and empirical disease risk) were studied but all showed a substantial health benefit of around 20%.

2. **Sustainable Food Production:** providing a safe-operating space that if we do not surpass it, the risk of destabilizing the Earth's system is null. In order to achieve such solidity, the following actions are needed:
    a. Decarbonize all the food system
    b. Stop expanding agriculture
    c. Halt biodiversity loss
    d. Improve water productivity
    e. Start cycling nitrogen and phosphorus

    Rockström emphasized that it is necessary to bend the global curve (Figure 5) by 2020 to achieve the set goals in COP21 (3).

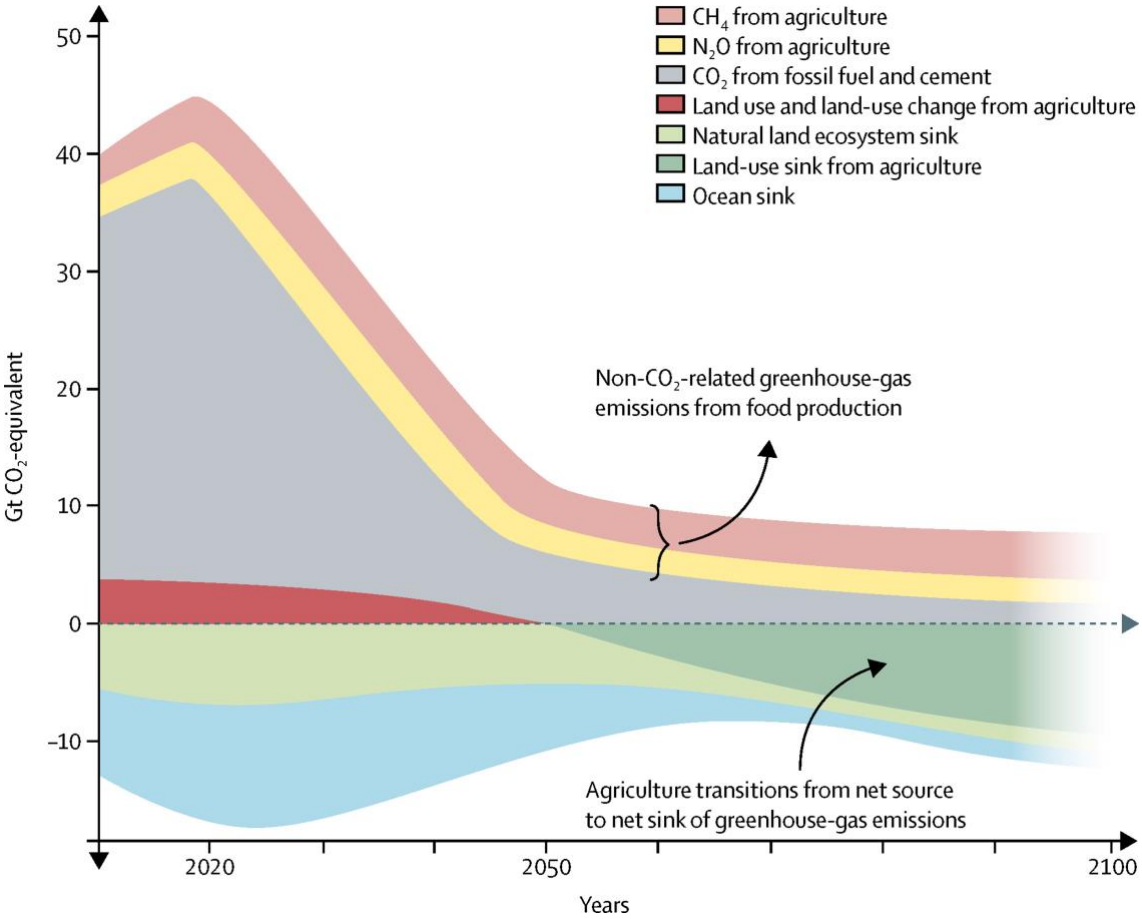

Figure 5. *Projections of global emissions to keep global warming to well below 2ºC, aiming for 1,5ºC (12).*

It was discussed during the event that when studying the fusion of both a healthy and sustainable diet, potential pathways are considered to achieve Planetary Healthy

Diets. However, only one condition showed that it is possible to keep us into the safe operating space and contribute to the Paris Agreement. The professors underlined that this is the best scenario (the last scenario listed in the *Table 1*) and it is the result of a combination of a health, technology and waste reduction approach:

- Diet: Dietary shift from current diet to Planetary Health Diet
- Waste: A 50% reduction of both food and waste loss
- Food Production: applying PROD[+1] closing yield gaps to 90% (using only available existing land) and efficiency in cycling N and P.

			GHG emissions	Cropland use	Water use	Nitrogen application	Phosphorus application	Biodiversity loss
Food production boundary			5.0 (4.7–5.4)	13 (11.0–15.0)	2.5 (1.0–4.0)	90 (65.0–140.0)	8 (6.0–16.0)	10 (1–80)
Baseline in 2010			5.2	12.6	1.8	131.8	17.9	100–1000
Production (2050)	Waste (2050)	Diet (2050)						
BAU	Full waste	BAU	9.8	21.1	3.0	199.5	27.5	1,043
BAU	Full waste	Dietary shift	5.0	21.1	3.0	191.4	25.5	1,270
BAU	Halve waste	BAU	9.2	18.2	2.6	171.0	23.2	684
BAU	Halve waste	Dietary shift	4.5	18.1	2.6	162.6	21.2	885
PROD	Full waste	BAU	8.9	14.8	2.2	187.3	25.5	206
PROD	Full waste	Dietary shift	4.5	14.8	2.2	179.5	24.1	351
PROD	Halve waste	BAU	8.3	12.7	1.9	160.1	21.5	50
PROD	Halve waste	Dietary shift	4.1	12.7	1.9	151.7	20.0	102
PROD+	Full waste	BAU	8.7	13.1	2.2	147.6	16.5	37
PROD+	Full waste	Dietary shift	4.4	12.8	2.1	140.8	15.4	34
PROD+	Halve waste	BAU	8.1	11.3	1.9	128.2	14.2	21
PROD+	Halve waste	Dietary shift	4.0	11.0	1.9	121.3	13.1	19

Table 1. *Scientific targets to quantify food production boundaries (30).*

- **Five strategies** were defined for a Great Food Transformation, all based on strong evidence:

1. **Seek international and national commitment to shift towards healthy diets.** there is a necessity for dialogue, regulatory measures or a council approach on sustainable food. As mentioned in the 17th SDG, the need for partnership between countries and businesses is indeed crucial (18). Furthermore, the lecture remarked that an efficient and possible rule would be setting food prices that truly reflect their costs in the supply chain, promoting dietary guidelines that considerate

[1] PROD[+]: This is a way of improving food production practice by closing yield gaps to 90%, improving the nitrogen and phosphorus cycle and mitigating GHG associated with food production (12).

health and sustainability, educational campaigns. Following the proposed measures, The Lancet Commission states that:

> Governments should ensure facts are readily available to clients on the environmental footprints and health impacts of products. Such full disclosure will allow consumers to make fully informed choices and will create a demand-driven pressure for businesses to shift to healthier and more sustainable practices and products. (4)

2. **Reorient agricultural priorities** from producing huge quantities of food to producing healthy food.
3. **Sustainably intensify food production** to increase high-quality output by merging ecological and conventional agriculture techniques and closing yield gaps.
4. **Strong and coordinated governance** of land and oceans.
5. At least **half food losses and waste.**

At the end of the EAT-Lancet Launch Lecture, among all conclusions outstands:

> If we do not reshape the food systems towards healthy and sustainable diets, we are unfortunately bound to fail on Agenda 2030 UN SDG and we stand a very small chance of fulfilling and meeting the Paris Climate Agreement, so food transformation is essential for our socioeconomic and climate future. (3)

1. The inclusion between sectors such as food policy, food production, culture, community, is necessary due to their economic and social impact in society.
2. If dietary change does not take place by 2050, we will be facing 11 million premature deaths per year.
3. Feeding 10 billion people is possible following the Planetary Health Diet and both healthy for humans and the planet and will keep us in the safe operating zone.

From my point of view, I believe the publication of this work was key for discerning the framework of the food system and the complexity of the scenario. Modifications of the structure involve shifts in the energy, economic and health systems, among others. The transition will only be plausible if we consider every dimension of the subject. The practical analysis offered by the report allows for a global understanding of the situation while providing a possible solution for our future.

The Planetary Healthy Diet

Some studies have come up with the idea that a modified omnivorous dietary pattern, with very limited animal source content, could have a similar environmental impact compared to vegan diets (7). However, one of the main objectives of the EAT-Lancet Report was to design a diet that was both healthy and sustainable for healthy individuals from the age of 2 and older (12).

From my point of view, on the one side, foundations of a healthy diet have been defined before by numerous investigations. The majority of them stating that a Mediterranean-based diet seems to be the healthiest. On the other side, studies concerning sustainable diets have been conducted before by assigning the impact on GHG emissions to each diet. However, until now, there has not been any work referring to what possible diet follows these characteristics and neither to the way in which such transition should be approached from both the food consumption and production systems.

The EAT-Lancet Commission's idea to develop such diet is to provide the basic guidelines of how a healthy and sustainable diet both for humans and for the planet should look like. As the Commission reports:

> We have a high level of confidence, based on many reproducible lines of evidence that the reference diet that we have defined will meet nutritional requirements for children older than two years and adults, and reduce the incidence of non-communicable diseases and overall mortality. (12)

The Planetary Healthy Diet allows for flexible modifications "with room to tailor foods and amounts to the different references and contexts to reduce the risk of poor diets and environmental degradation" and to adapt to both national/regional/local or individual possibilities and needs (31). When comparing it with the actual diets, the main discrepancies are an increasing number of plant-based foods as a result to cutting animal food sources.

> Transformation to healthy diets by 2050 will require substantial dietary shifts, including more than a 50% reduction in global uptake of unhealthy foods, such as red meat and sugar, and a greater than 100% gain in consumption of healthy foods, such as nuts, fruits, vegetables, and legumes. However, every region will need different changes. (12)

As to what concerns the daily caloric intake of each individual, The Commission has delimited it at 2500 kcal per person per day since both overconsumption or underconsumption results in increased health and environmental costs (30). The development of this diet considers that although a general dietary pattern has been defined, there will be diet modifications according to local culture and cuisine. The *Food in the Anthropocene* Report remarks it is essential to understand that although Planetary

Healthy Diets are possible to achieve on a global level, the regional and national realities have to be evaluated to find balance between countries having too much and the ones with insufficient provisions (12). As it is clear, on the one hand, in low-income populations such as sub-Saharan Africa, substituting starchy carbohydrates by animal sources is likely to improve diet quality, nutritional state and overall health. On the contrary, high-income nations should be reducing the portions sold of these same products.

The images below are from the Summary Report mentioned before and shows the representation of what a Healthy Planetary Diet looks like (30).

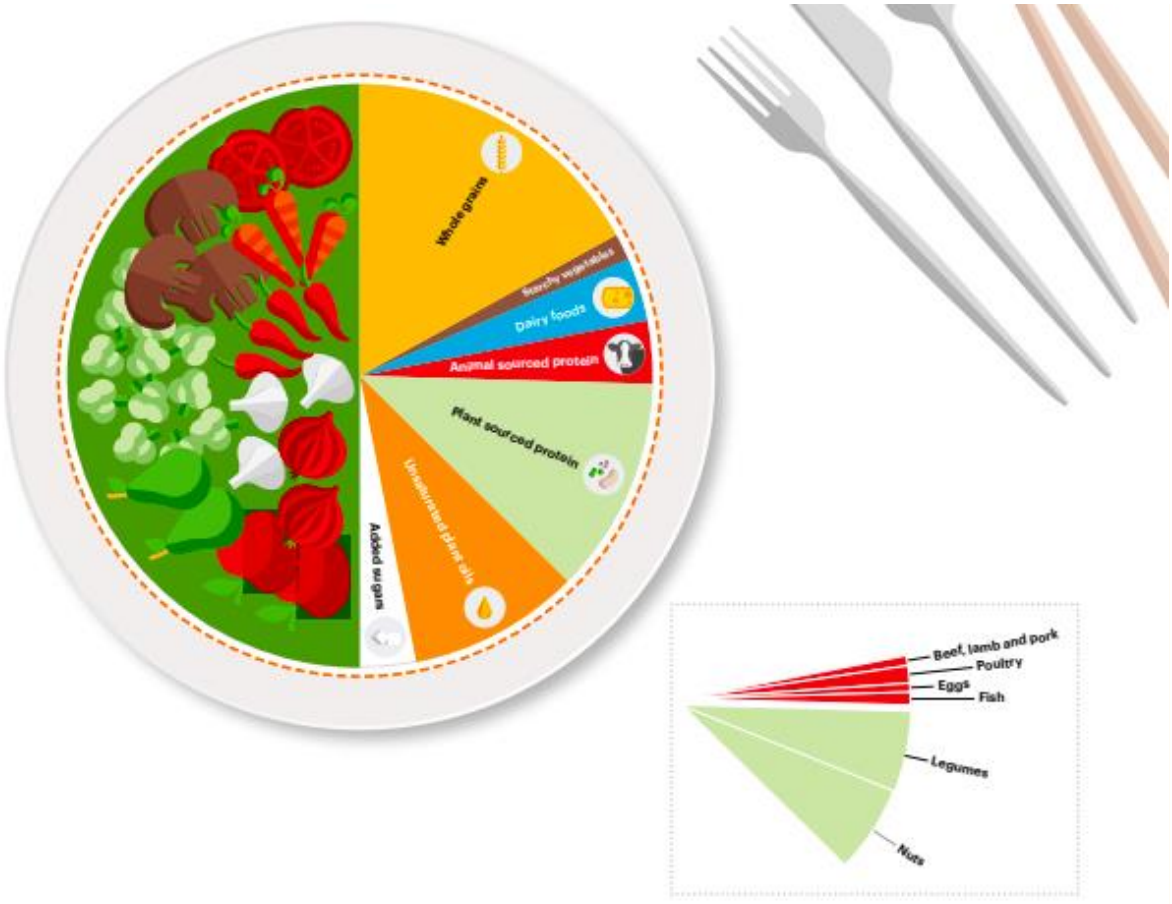

Figure 6. *Structure of a planetary healthy plate (30).*

	Macronutrient intake grams per day (possible range)	Caloric intake kcal per day
Whole grains		
Rice, wheat, corn and other	232	811
Tubers or starchy vegetables		
Potatoes and cassava	50 (0–100)	39
Vegetables		
All vegetables	300 (200–600)	78
Fruits		
All fruits	200 (100–300)	126
Dairy foods		
Whole milk or equivalents	250 (0–500)	153
Protein sources		
Beef, lamb and pork	14 (0–28)	30
Chicken and other poultry	29 (0–58)	62
Eggs	13 (0–25)	19
Fish	28 (0–100)	40
Legumes	75 (0–100)	284
Nuts	50 (0–75)	291
Added fats		
Unsaturated oils	40 (20–80)	354
Saturated oils	11.8 (0-11.8)	96
Added sugars		
All sugars	31 (0–31)	120

Table 2. *Scientific targets for specific food groups and acceptable ranges (30).*

As to what cities can do to address such issues and align to The Planetary Healthy Diet along, the EAT-Lancet Commission and C40 (discussed later) have listed some strategies to accelerate the Great Food Transformation (30):

- Producing urban food differently by promoting urban agriculture and community gardens to increase local food production, production of healthy foods, supporting local farmers and shortening supply chains thus decreasing GHG emissions.
- Changing procurement and distribution practises by endorsing accessibility to healthy and sustainable products, applying regulations for unhealthy foods, promoting a Planetary Healthy Diet in schools and education programmes.
- Adopting responsible marketing principles by supporting food labelling policies and advertisements that promulgate healthy and sustainable foods as well as a healthy planetary lifestyle.
- Addressing food loss and waste by launching technologies that enable an energy-efficient food distribution system, reducing food loss in public facilities, promoting food redistribution.
- Strengthening food system advocacy and governance by developing food strategies and policies, organizing communal education campaigns, establishing policies and bans for unhealthy foods, collecting data through indicators and monitoring the process.

C40 Cities

On my behalf and as I mentioned before, the effects of climate change have led to an increasing number of initiatives in order to counteract our impact on our environment such as reducing single-use plastic, removing plastic straws and many others.

A huge project named C40 Cities has been developed in collaboration with 94 of the biggest cities around the planet that "are taking bold climate action, leading the way towards a healthier and more sustainable future" (31). By this meaning that "more than 700 million citizens and one quarter of the global economy" are committed to achieve the goals defined in COP21. Some of the cities that are involved in the programme are Copenhagen, London, Lima, Los Angeles, Milan, Oslo and Barcelona amongst many others.

Figure 7. *C40 Cities members (31).*

The basis for the C40 project is that measures are more effective in cities generally, especially in the bigger ones. This is due to a few determinants such as the possibility of reaching more people, the premise for which the majority of the population is thought to live in cities by 2050, because cities are "more likely to take action if a goal has been established" and the fact that city-to-city collaboration is a reality (31). All programmes developed by C40 Cities, are centred on improving the key factors that have shown more impact on climate change evolution. Some examples of these actions are focused on reducing GHG emissions, encouraging zero-carbon buildings or carbon neutrality, affordable and sustainable mobility and many others. Amongst these, I consider quite

Figure 8. *Cities are more likely to change (31).*

interesting to remark for this essay their initiative to promote environmental dietary patterns (32).

RESEARCH FINDINGS

In June 2019, C40 published a report named *The future of urban uptake in a 1,5 ºC World* in cooperation with ARUP and University of Leeds (33). The findings of this article show that in 2017, 13% of total consumption-based emissions across C40 cities derived from, from which animal-based food intake accounted for 75% and plant-based foods only for the remaining 25%. Furthermore, this study emphasizes that reshaping the diet and diminishing waste in both the supply chain and the household could reduce by 36% GHG emissions within 10 years and by 60% within 40 years. Therefore, it remarks three consumption interventions that were determined to achieve three key benefits:

- Dietary change: has been defined to be the intercession with greater potential for decreasing GHG emissions. Supporting a transition towards lowering meat and dairy intake and increasing plant-based foods with a slight modification of the single caloric uptake. The progressive goal to reach by 2030 is a maximum individual consumption of 16 kg of meat per year, 90 kg of dairy per year and 2500 kcal per day.
- Reducing household waste minimum by 50% in 2030
- Avoiding waste loss along the supply chain by 50% as well, in 2030

Following the actions that have been determined, would derive in three key benefits: enhancing health and longevity of citizens, avoiding deforestation and wasteful freshwater use, and saving money at an individual and global level.

Major outcomes of the report indicate that a transition from the current diet towards a healthier plant-based diet would prevent 170.000 deaths per year with such outcome resulting in a health improvement and reduction of costs (less health resources needed).
The study emphasizes as well that although it is commonly known that not taking action to stop climate change will lead to a significant increase in number of the overall worldwide temperature and sea level, there are many other factors to be discussed as well (Figure 9). Some examples of critical risks related to food systems are food insecurity and water availability. The following report estimates that 2,5 billion people and 1.600 cities will be suffering of food insecurity if this dietary change does not occur.

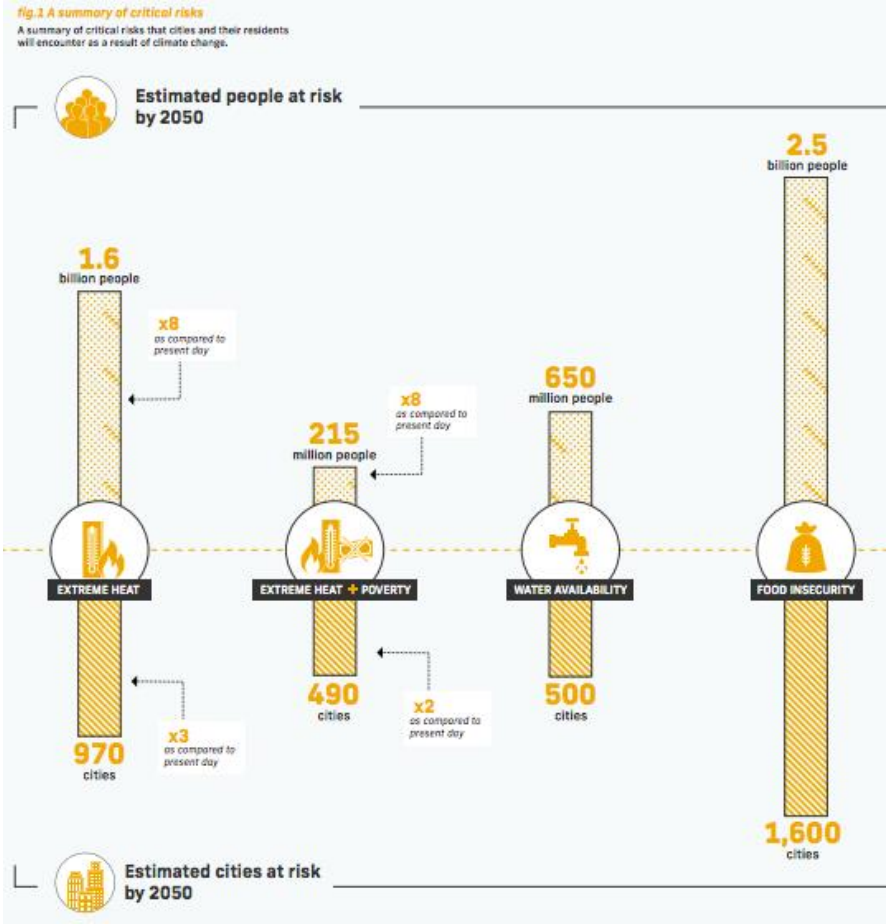

Figure 9. *Estimated risks by 2050 (33).*

As mentioned before, the main objective of the C40 Cities was developing ideas for big cities since this would lead to not only a greater but more extensive environmental, social and economic impact. Therefore, C40 cities will reduce the critical risks already stated, resulting in fewer deaths by 2050 (33).

I consider it is essential to discuss projects such as C40 Cities since it is in Barcelona's duty, as a city member, to promote initiatives that are aligned with the C40 proposal strategies. A general overview is necessary to make coherent national and individual decisions.

The Good Food Cities Declaration: Achieving a Planetary Healthy Diet for All

In the same context, in October of 2019 C40 Cities published, *The Good Food Cities Declaration: Achieving a Planetary Healthy Diet for All*, in which they state that food production and consumption is one of the major contributing factors to climate change, land-system change, freshwater use and others (34). This paper shows that:

> In 2017, emissions associated with food intake in C40 Cities accounted for an estimated 13% of cities' total greenhouse gas (GHG) emissions, with consumption

> of animal-sourced food representing roughly 75% of those food emissions. Most of the world's food is consumed in cities. (34)

The main idea behind the C40 Cities concept is to cooperate and join all efforts towards developing a strategy to fulfil the same goal, the COP21 target (31).
Cities compromised to *The Good Food Cities Declaration*, will implement actions so a Planetary Healthy Diet can be achieved by 2030 (34). In order to succeed with this 2030 objective, four specific measures (four-commitment declaration) have to be adopted by each city member:

1- Align food consumption to the Planetary Healthy Diet, ideally produced by organic agriculture
2- Promoting a healthy plant-based diet
3- Halving food loss and waste compared to the 2015 baseline
4- Multi-sectorial and multidisciplinary partnership:

> Within two years of endorsing this statement, working with citizens, businesses, public institutions and other organizations to develop a joint tactic for implementing these measures and achieving these goals inclusively and equitably, and incorporating this initiative into our Climate Action Plan. (34)

Fourteen cities around the globe are compromised to *The Good Food Cities Declaration*: Barcelona, Copenhagen, Guadalajara, Lima, London, Los Angeles, Milan, Oslo, Paris, Quezon City, Seoul, Stockholm, Tokyo and Toronto (31). Every city will effectuate the four-commitment declaration, mentioned before, adapting it to the country's possibilities thus, each final strategy will be different (34).
It goes without saying that it is important to know the basis of this declaration to understand the actions Barcelona is committed to implement, however, details of the defined activities are to be found within the next section.

The Food Systems Network (EAT-C40)

The Food Systems Network was created by EAT and C40 Cities to help accelerate and **enhance urban food system resilience**; strengthen interdisciplinary collaboration across countries and states, and providing scientific expertise knowledge (30). EAT-C40 assists cities that have joined the network if facing environmental or social issues related to food systems. The partnership of both organizations focuses on working together, however, each institution offers solutions of the topic they master. On the one hand, problems addressed by EAT are more connected to nutrition, sustainable food and health. On the contrary, concerns about climate action such as a need for information or effective measures are covered by C40.
The network classifies issues in five different categories according to the priority of the member cities:

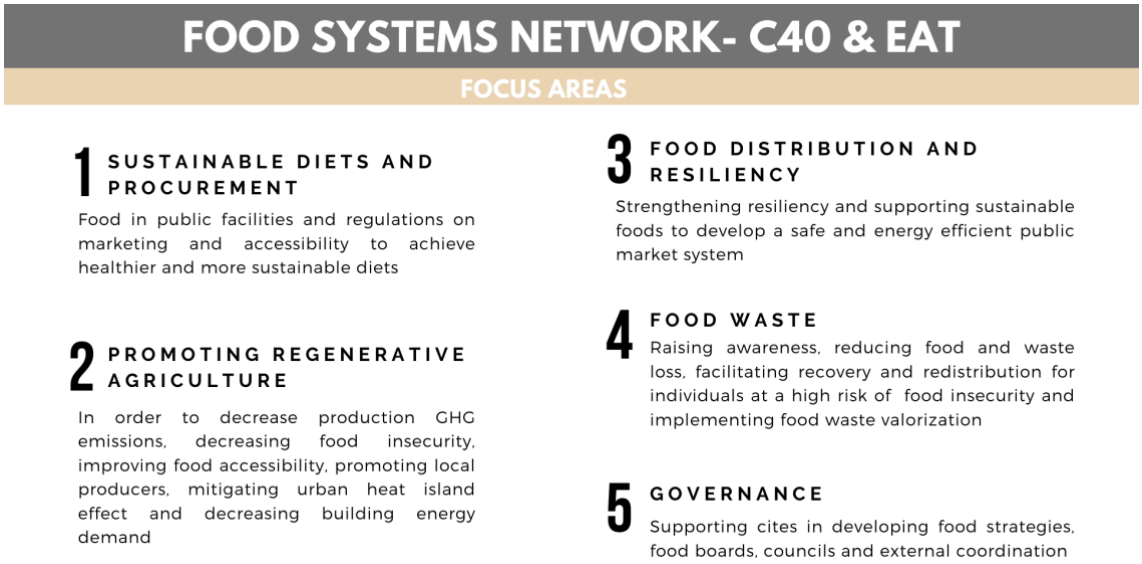

Figure 10. *Adaptation of the Food Systems Network (30).*

I consider this to be an important point to cover since it is interesting to know that Barcelona's transition, as well as the other member cities, towards a healthier and more sustainable food system will face obstacles and difficulties. In fact, the Food Systems Network has been created to tackle them and advise cities on how they should be addressing these problems.

European Overview

After the CAP modifications in 2018, the European Committee of the Regions (CoR) was asked to make suggestions about the future of the CAP after 2020 with a refocus towards constructing "a policy that is fair, sustainable and based on solidarity" (35). Measures that were recommended were equitable prices for agricultural products, revitalizing rural areas through Smart Villages, supporting young European farmers, the simplification of the CAP and some others. Furthermore, these proposals have established for the future CAP to assure long-term environmentally friendly agriculture, the actual CAP needs to target:

- Climate change and the SDGs
- Improvement market resilience and risk management
- Supporting farmers in the food supply chain
- Rural development
- Investment support and improving infrastructure
- Generation renewal including access to land

It is appropriate to end this section by mentioning that in December of 2019 the EC launched *The European Green Deal* as "an integral part of this Commission's strategy to implement the United Nations' 2030 Agenda and the Sustainable Development Goals" (36). This initiative comprises three concrete actions: presenting a Sustainable European Investment Plan; ensuring climate neutrality is achieved by 2050 and a Just Transition Fund so the transition is inclusive for all EU countries. As to what concerns the climate neutrality, in March 2020 the EC will propose the first European Climate Law.

Furthermore, in spring 2020 the Commission will launch the forthcoming Farm to Fork named *From 'Farm to Fork': designing a fair, healthy and environmentally friendly food system* in order to promote healthy and sustainable food consumption (37).

I consider it is essential to understand the most important EU measures implemented across all levels of the food supply chain since they are clearly reflected in the modifications Barcelona has recently applied to their food system. Specifically, I wanted to discuss actions being developed by the EC since the European food system is recognized for its safety and high-quality food products. The excellence of the process itself is due to the widely known and mentioned before, "Farm to Fork" strategy.

***The Global Syndemic of Obesity, Undernutrition, and Climate Change: The Lancet Commission* report**

In February 2019 *The Global Syndemic* report was published discussing the three pandemics that are currently affecting all regions around the globe: obesity, undernutrition and climate change (4). *The Global Syndemic* "represents the paramount health challenge for humans, the environment, and our planet in the 21st century".

As far as I am concerned, as well as it has happened with the SDGs and COP21 goals, the population does not conceive the burdens of obesity thus, the need for policies and government actions. The Planetary Healthy Diet and both the SDGs and 2030 Agenda consider these three pandemics since the transition towards a healthier and more sustainable future it is indeed to address and diminish such issues.

Back to the report, the Lancet Commission has proposed several recommendations to mitigate these three pandemics: "creating sustainable and health-promoting business models for the 21st century will shift business outcomes from a short-term, profit-only focus to profitable, sustainable models that explicitly include benefits to society and the environment" (4). Among these recommendations it is highlighted the subsidies of food

contributors to the pandemics (highly processed foods) and redirecting them towards sustainable and local production of healthy foods.

Barcelona's Overview

On January 15 of 2019, the mayor of Barcelona, Ada Colau, declared that the city was in a state of **climate emergency** (2). As it is explained in the report of Barcelona's City Council itself:

> We must therefore gear the whole system towards achieving zero carbon emissions by 2050 as a matter of urgency. Five countries alone are responsible for almost 60% of greenhouse gas emissions, and only twenty multinational companies for 35%. Climate justice means that those who are most at fault must make the greatest effort. (2)

The aim of this report was to establish some initiatives that would have a significant effect on slowing down the impact of climate change. Actions from seven different work fields planned to be developed can be found in Figure 11.

***Figure 11**. 7 model changes defined by Barcelona's City Council (2).*

Barcelona as a C40 city member

The Good Food Cities Declaration, previously discussed, defines general actions for all city members. However, national and regional specific tactics are developed in order to adopt the measures to the culture, economic possibility and the law. Furthermore, C40 offers the *Good Food Cities Declaration Planned Actions To Deliver Commitments as well* (38). Barcelona as a City committed to the *Good Food Cities Declaration*, aimed to

follow their engagement with the proposal of these seven model changes. Among them I would like to bring special attention to the food model modification initiative. As it was mentioned before, the *Good Food Cities Declaration* had four commitment declaration points (bold type) (34). Actions that Barcelona is progressively applying to follow it are (38):

1- **Align food consumption to the Planetary Healthy Diet:**
    - Including and endorsing the terms of local and ecological products in public contracts related to food procurement and local authority subsidies.
    - Introducing municipal measures to introduce criteria related to food sustainability.

2- **Promoting a healthy plant-based diet:**
    - Increase the number and the information about local, healthy and ecological products in key selling locations (supermarkets, markets and others).
    - Promote events and public campaigns to increase society awareness
    - Apply the diet "1 day no meat" in public canteens (schools, health facilities, etc.).
    - Promote healthy and sustainable food education.
    - Give support to initiatives and tools (apps) that are simplifying the transition towards improving the accessibility to healthy and sustainable foods.
    - Perform activities in order to increase knowledge and raise awareness.
    - Share the impact of food consumption on climate change thus, the power of our actions.
    - Work towards the removal of the legal food production ban in Barcelona's district.

3- **Halving food loss and waste compared to the 2015 baseline:**
    - Giving support to projects that aim to rearrange food loss particularly the vulnerable people.
    - Raising awareness and reducing food loss in schools.

4- **Multi-sector and multidisciplinary partnership:**
    - Creating one or more Centros de Intercambio Alimentario de Proximidad (CIAP) [Local Food Exchange Center] to facilitate the contact between local and sustainable producers, and point-of sale and shops to consume.

- Actively participating in mayor's meetings from the Milan Treaty[2].
- Establishing closer relationships and working together along the farmers of the territory through the development of specific projects.
- Promoting forums for participation of the society and co-creation with the population and organizations related to the food system.
- Obtain the Food Capital title of the Milan Treaty (2021 or 2022).

I am of the opinion that it is important for Barcelona's population to be aware of not only the objectives the city is committed to but what actions are involved in each strategy. Greater communication of the intended measures would probably result in higher acceptance.

Barcelona's Diet

González-García et al. published a recent study in early January 2020 regarding the environmental impact of Spanish dietary recommendations. They found that compared to the Southern European Atlantic Diet and the Spanish Dietary Guidelines (NAOS), the Mediterranean Diet had the lowest animal sources content, GHG emissions (carbon footprint) and water footprint (39). Although the traditional Mediterranean Diet contained fewer meat content, such as 35 g/day of both poultry and red meat, in the last decades the Mediterranean diet has been **westernized** thus, the importance of the report and the reason why the Spanish Ministry of Health and Costumer Affairs has applied initiatives for promoting healthy dietary patterns (12). The concern of the Spanish Ministry may come from the outcomes of the tremendous increase in meat consumption in Spain overcoming the standard recommendations (39).

[2] Milan Treaty: "a non-binding agreement on urban food policies *designed by cities for cities* […] that illustrates the role of cities in contributing towards the transformation of urban food systems towards sustainability" (45).

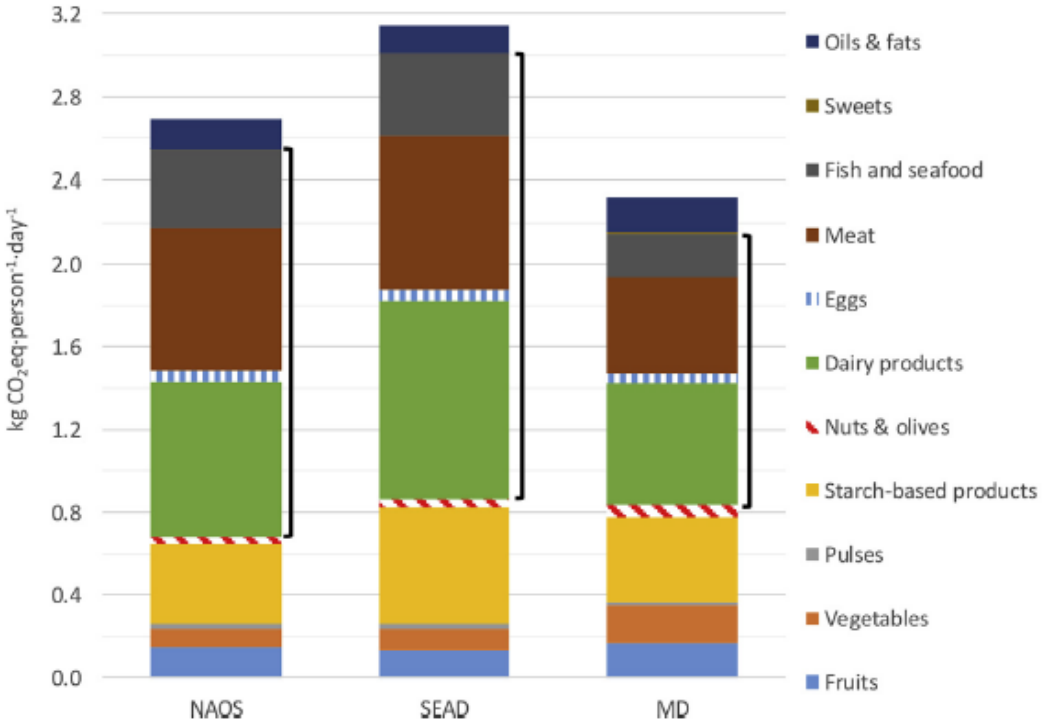

Figure 12. *Comparison of different diets and their GHG emissions effect (Lines in black indicate animal food sources) (39).*

Our World in Data published data on the average total supply per person around the globe between 1961 and 2017 in which Spain presented a value of 21,78kg and 100,25kg of meat per person per year, respectively (40). In my opinion, the evidence is frightening though ineluctable thus, urgent action is needed. González-García et al. suggested that measures that should be adopted should be premised on increasing the alternative plant-based foods, providing more information about food production location or endorsing campaigns and nutritional education programmes (39).

Furthermore, as to what concerns to adolescents and children, the promotion of a Planetary Healthy Diet for children in urban areas has recently been discussed in the World Urban Forum held in 2020. In the encounter they argued ways to involve more the children and youth in the transition (41). Similarly, the Lancet Commission also considers that "Convening organizations like the World Economic Forum could help to redefine the business prototypes for the 21st century and lead the shift away from narrow, profit-maximization approximation into broader models better able to deliver for people, planet, and prosperity" (4).

Barcelona's red meat reduction measure in school canteens

In 2018, the Agència de Salut Pública de Barcelona (ASPB) [Catalan Public Health Agency] already started executing nutritional guidelines premised on the SDGs (42). Further on, aligned with the *Good Food Cities Declaration*, at the end of January 2020 Colau implemented an initiative in five school canteens of Barcelona to reduce red meat intake and increase plant-based proteins (11). Future proposals consist of applying such measures in the other 411 schools of the city.

The basis for this decision is the outcomes of a study made and published in 2019 by the ASPB. Their work analysed the eating habits of children and adolescents in Barcelona and the results were quite terrifying (43):

- 78%, age of 3–4, of children and 42% teenagers, 16–19 years old, overcome the recommendation of <3 times of meat a week
- 43%, ages between 8 and 9, consume high sugar pastries.
- More than 80% of children and teens do not meet the five recommended vegetables and fruit portions per day

Furthermore, the ASPB also disclosed two analyses, one in 2017-18 and one in 2019, of school's canteens to evaluate the structure of the menus. The report they published about their review in the 2017–2018 academic year indicated positive outcomes, however, the posterior one differed (44). I believe it is important to remark that in the 2019 paper, 34% of the schools were offering meat twice or more per week and that 90% did not have any second dish with plant-based proteins (43).

6. Discussion

My idea behind this thesis was to expose how food policies have historically evolved, the reason why this change is necessary and to present what evidence is supporting these statements.

As it was analysed in the first part of this paper, food systems have been modified due to many factors that society faces as critical situations. These can be either war, financial crisis or climate change. All along this dissertation we have examined how worldwide political institutions have fought to rearrange priorities and include climate change regulations on the agenda. Examples mentioned are the UN's Kyoto Protocol, Paris Agreement, Climate Action Summit, 2030 Agenda and SDGs; the EC's *White Paper on Food Safety*, *White Paper on the Future of Europe*, *The European Green Deal*, CAP modifications and *From 'Farm to Fork': designing a fair, healthy and environmentally friendly food system*. Furthermore, my investigation was also focused on highlighting institutions that had no political authority but were crucial for this process. Examples include EAT, the EAT-Lancet Commission and EAT's Planetary Healthy Diet development; C40 Cities and their *Good Food Cities Declaration*, and finally EAT-C40's collaboration on the Food Systems Network creation. Lastly, this monograph emphasized the scientific evidence that has been provided by different international corporations clearly identifying the need to tackle the issue as a matter of urgency. Therefore, the implemented initiatives mentioned before were based on the high-quality evidence of these reports ergo, I believe these studies are of fundamental importance because they confer a transparent and trustworthy characteristic to the studies. The list of examples is wide, from IPCC and IPBES reports such as *Climate Change and Land*; EAT-Lancet's *Food in the Anthropocene* paper; C40 Cities' *The future or urban consumption in a 1,5 ºC World*; *The Global Syndemic* dissertation from the The Lancet Commission, to regional studies like the eating habits analysis made by the ASPB.

Evidence shows that it is time to modify the food system at all levels: from a global scale and through all constituents of the supply chain. It is essential to make population responsive of their role inside the process as it is being done by the Good Food Cities Declaration by supporting local and ecological farmers, promoting healthy dietary patterns and raising awareness of the environmental impact. Although these results may seem quite frightening, they are indeed promising as the idea of achieving the COP21 and 2030 Agenda target goals is still possible and remains on the table. Practical examples for suggested measures have been developed such as the Planetary Healthy Diet and the Shifting Urban Diets. Firstly, the Planetary Healthy Diet presents a more pragmatic and visual tool of how population can contribute towards attaining a healthy and sustainable food model, though further research is necessary to understand how countries can economically enable the process since:

> The EAT-Lancet Commission has not calculated the economic or social costs of the recommendations. It flags that there are significant economic and social values to the recommendations, including in reducing national and individual healthcare expenditures, improving quality of life, and collective contributions to environmental security with significant implications on disaster spending. (30)

However, countries should already be aligning their dietary recommendations with the Planetary Healthy Diet, providing more information about what a healthy and sustainable diet consists of and promoting educational campaigns.
Secondly, the project Shifting Urban Diets has presented the Copenhagen case as an strategic model and to facilitate cities' practical concerns when modifying current food policies to make them more environmentally friendly.

The EU has also adjusted regulations around the food system, modifying the CAP and adapting the "Farm to Fork" strategy, to transition towards a healthier and more sustainable one.
At the national level, after Barcelona's climate emergency declaration, in January 2020, Barcelona's City Council decided that reducing red meat in school's canteens would be an efficient approach aligned with the 2030 Agenda and the SDGs. Moreover, the City Council has been developing plenty of measures to address the issue. Barcelona as a part of Spain is a member of the Climate Action Summit thus, has to achieve carbon neutral emissions by 2050. Furthermore, as published by Our World in Data, Spain has increased tremendously its meat intake in the last half-century while changing the real Mediterranean diet. Therefore, Barcelona's commitment as a C40 member is to modify these issues and redirect their food system priorities to raise awareness and concern for healthy foods and sustainability. The actions the City Council has implemented are strongly supported by international organizations, such as EAT, C40, UN, FAO, WHO, EC, and bring Barcelona to a strategic position at the global level. If considering the national perspective, Barcelona is playing a pioneer role and an example to follow. By applying these measures, Barcelona will not only be reducing their GHG emissions and their environmental footprint while improving food security, as previously defined by the IPCC *Climate Change and Land* report.
While a small part of the population will question the actions implemented, clearly, ignorance will be the main cause since the biggest institutions in the world are supporting such change, it is none-sense to reinforce such belief.

As it may be noticed, cities rising to this challenge are of a significant size. I would like to dedicate a couple of lines to recognize their major effort and the fact that making such decisions implies accepting the uncertainty of our evolution and the limitation of our knowledge. Without such courageous leaders, we would all be facing much worse consequences.

7. Conclusion

Aligned with the hypothesis proposed at the beginning of this project, evidence from IPCC, IPBES and the EAT Lancet Commission show that food systems have a major impact on the planet and that changing food systems are needed in order to stop climate change from getting worse.

Both the Agenda 2030 and the SDGs from the UN have directed their focus on setting attainable goals like the modification of the food consumption patterns and production. The development of a new food model concept has risen after organizations such as the UN, the EC or the C40, have started implementing measures to mitigate our environmental footprint. However, the EAT-Lancet Commission has been the first to explicitly mention the need for "The Great Food Transformation". Such transformation has to occur as a progressive and integrative transition regarding a multi-sectorial and multidisciplinary in order to facilitate the shift for the population. Another crucial determinant is a global understanding of the matter and the will of countries to work as an ensemble.

As established by the second objective of this thesis, even though vegan and vegetarian diets are renowned by their low environmental impact, the *Food in the Anthropocene* report of the EAT-Lancet Commission provides the highest quality evidence studies supporting that it is possible to achieve the COP21 and Agenda 2030 targets, without cutting out dietary animal sources but limiting them to fewer levels. Furthermore, they were the ones to develop the concept of a Planetary Healthy Diet that would allow both healthy and sustainable diets for the expected Earth's population by 2050 and would keep us in the safe-operating space while meeting the global set goals. It is also important to remark the scope left for adaptation to cultural, economic and personal preferences.

Lastly, the decision made by the City Council of Barcelona in 2020 of decreasing red meat in school's canteens, is an efficient approach aligned with the 2030 Agenda and the COP21, and highly supported by the evidence provided of all the reports and papers mentioned in this project. The need for the implementation of such measures is urgent as defined by the EAT-Lancet Commission "Data are sufficient and strong enough to warrant action; delay will increase the likelihood of not achieving the Sustainable Development Goals and the Paris Agreement" (12). Furthermore, Barcelona as a city member of the C40 Cities and the Good Food Cities Declaration, is committed to apply such regulations in order to reduce its environmental impact. As previously stated by C40 Cities, cities have both the power to influence more people and fulfil greater outcomes thus, it is needed in the future that cities around the world cities start implementing these measures. Ultimately, the food policy changes that have been taking place in Barcelona are not only supported by high quality scientific evidence and global organizations but is indeed correct and necessary to meet the goals.

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