



Horizon 2020 Societal challenge 5:  
Climate action, environment, resource  
efficiency and raw materials

## COP21 RIPPLES

### COP21: Results and Implications for Pathways and Policies for Low Emissions European Societies

GA number: 730427, Funding type: RIA

<b>Deliverable number</b> (relative in WP)	<b>D2.2</b>
<b>Deliverable name:</b>	Co-design of macroeconomic and transition scenarios
<b>WP / WP number:</b>	2.2
<b>Delivery due date:</b>	December 2017; Post-review: End September 2019
<b>Actual date of submission:</b>	29/06/2018; Post-review: 10/02/2020
<b>Dissemination level:</b>	Public
<b>Lead beneficiary:</b>	IDDRI
<b>Responsible scientist/administrator:</b>	Henri Waisman (IDDRI)
<b>Estimated effort (PM):</b>	12
<b>Contributor(s):</b>	Marta Torres, Henri Waisman, Roberta Pierfederici, Lola Vallejo (IDDRI), Michael Grubb (UCL) and Aleksander Sniegocki (WiseEuropa)
<b>Estimated effort contributor(s) (PM):</b>	2
<b>Internal reviewer:</b>	Sebastian Oberthuer (VUB-IES), Wolfgang Obergassel and Lukas Hermwille (WI), Gabriel Anandarajah, Alvaro Calzadilla (UCL), Tim Rayner (UEA), Annela Anger (UCAM), Michiel Shaeffer and Fabio Serra (CA)



## 1. Changes with respect to the DoA

*(with justification if applicable)*

D2.2 was scheduled for month-13, but it was only been submitted in month-19. The delay was due to the need for a consortium-wide face-to-face meeting to ensure the entire set of narratives were solidly agreed and owned by all the partners. This was critical for the multidisciplinary approach that distinguishes COP21 RIPPLES. The delay had no implications for other tasks, as path-dependant inputs were provided when needed (notably the harmonised parameters for the first family of scenarios needed under WP3).

After the half-term external review, a re-submission was scheduled for the end of September 2019, acknowledging that Project Narratives would evolve as the Project advances, and therefore the need to wait towards the end of the Project. Given the delays of other deliverables within the Project and the decision to extend the end of the Project, D2.2 re-submission has suffered a delay until February 2020.

## 2. Dissemination and uptake

*(who will/could use this deliverable, within the project or outside the project)*

This deliverable is to be used within the project to inform the analysis across WPs (WP2, WP3 and WP4) and the development of outreach material and concepts for stakeholder engagement in the context of policy dialogues (WP5).

## 3. Short Summary of results (<250 words)

IDDR has developed a methodological approach based on transition narratives that allows for the integration of multidisciplinary inputs into a common story. It creates a soft-linked dialogue between the governance aspects of the transition and the quantitative analysis of scenarios, achieving a more comprehensive vision of the low-carbon transformation. It starts by identifying the main policy questions to be addressing:

- What are the advantages and disadvantages of increasing ambition in the short term?
- What does it mean to pursue efforts to limit to the 1.5 goal?
- What are the implications of specific countries and/or sectors cooperating to take the lead?

It used a set of six narratives that allow for structuring the research questions at deliverable-level and the dissemination products and activities of COP21 RIPPLES. These narratives evolved over time to take into consideration the results of the research deliverables, stakeholder engagement feedbacks, and importantly, to cater for the flexibility required to create a common story while remaining policy-relevant. The emergence of multidisciplinary policy briefs and recommendations are the evidence that the Project Narratives successfully served as a tool to articulate a common language. The final Narratives are best structured as Narratives of Timing, Narratives of Transformation and Narratives of Leadership.

## 4. Evidence of accomplishment

*(report, manuscript, web-link, other)*

A report is submitted and uploaded in the COP21 RIPPLES website.



## Table of contents

1	Introduction .....	4
2	The concept of narratives in COP21 RIPPLES .....	5
2.1	Co-design nature of the Project Narratives .....	7
3	Framing the policy questions .....	9
3.1	What are the advantages and disadvantages of increasing ambition in the short term? .....	11
3.2	What does it mean to pursue efforts to limit to the 1.5 goal? .....	12
3.3	What are the implications of specific countries and/or sectors cooperating to take the lead? .....	13
4	Initial narratives to explore different transition stories .....	15
5	COP21 RIPPLES global scenarios characterization .....	21
6	Final narratives that build bridges .....	24
7	References .....	26



## 1 Introduction

By the end of 2015, the 21<sup>st</sup> Conference of the Parties (COP21) culminated in the Paris Agreement (PA). This outcome represented an important new strategic context for climate policy around the world. Today we continue to lack a deep understanding of its implications. Extensive research and policy dialogues are contributing to fill this gap. One of these ongoing efforts is the COP21 RPPLES project.

This deliverable discerns some global transition storylines that frame the various analyses under this project, what we call ‘narratives’. In Section 2, we explain COP21 RPPLES concept to use these storylines to respond to specific policy questions using a multidisciplinary approach and a diverse set of quantitative and qualitative tools and methods, and unpacks further the elements of their co-design. These storylines are designed to respond to some of the critical policy questions that are emerging at international level and within the EU in relation to the pathways towards low emissions societies. Section 3 identifies these policy questions, and Section 4 describe the different narratives in relation to these policy questions, in the way they were initially conceived. Section 5 describes the translation of these narratives into global modelled scenarios. Last, Section 6 describes the final narratives by the time of wrapping up the Project, as a result of the multidisciplinary conversations over research results in the actual policy context.

### **Further background to this deliverable**

After the delivery of this report in June 2018, the Project was submitted to an external review which provided valuable discussions and a revision of this report was agreed under the follow recommendations: “This report deserves a revision to better explain how the narratives were defined, to provide a better description of the narratives and clarify how they relate with the rest of the work packages and tasks”.

Accordingly, this updated version contains the following changes:

- It adds more detail in the explanation of the concept and its operationalization within the Project, including the engagement with stakeholders (Section 2)
- It contains minor updates and clarifications for the existing section on “framing policy questions”
- It includes a new section (Section 5) to explain the translation of narratives into global scenarios
- It includes a new section (Section 6) to distill the final narratives as we reached the end of the Project



## 2 The concept of narratives in COP21 RPPLES

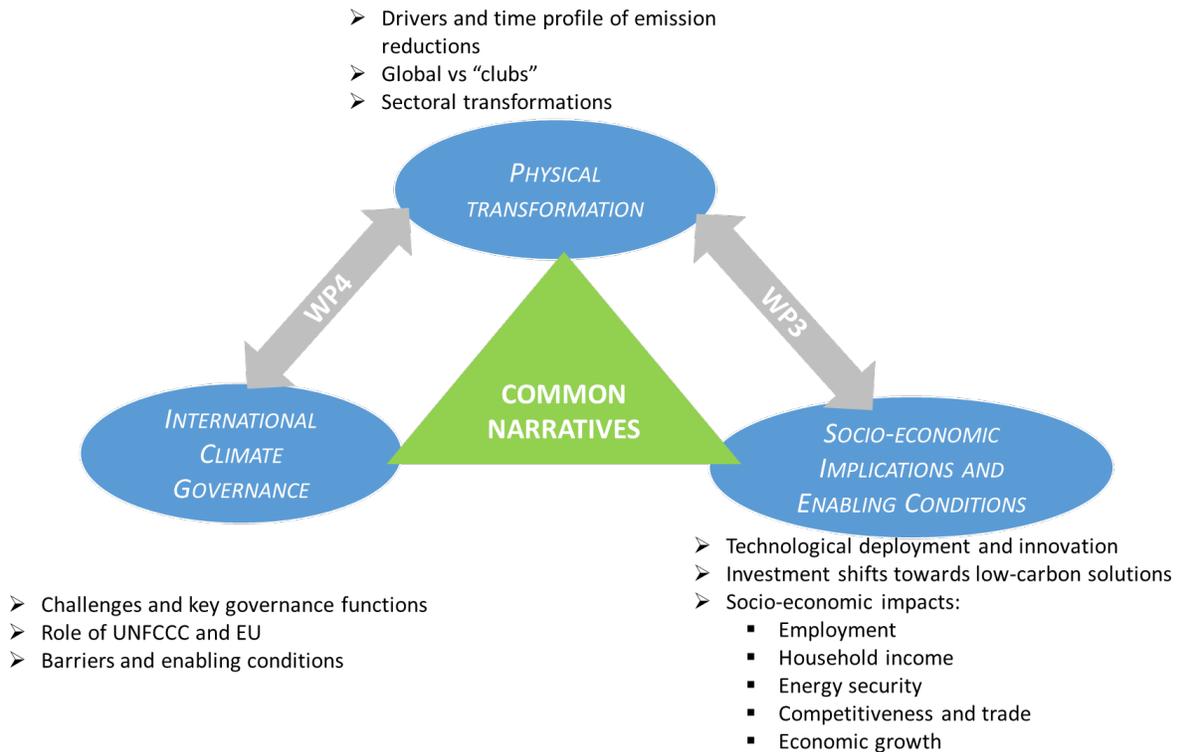
A key driver of COP21 RPPLES is to inform the climate policy position of the EU in the global context and its contribution to the international negotiations, notably in relation to the Nationally Determined Contributions (NDC) review process, the development of Long-term Strategies (LTS) and other means for meeting the mitigation goals of the PA. For this, COP21 RPPLES equipped itself with a multidisciplinary team that is able to answer questions on the benefits and trade-offs of the transition to low-carbon societies, as well as mapping the main drivers and bottlenecks that this transition will face.

A key added value of COP21 RPPLES is its multidisciplinary approach, which is known to be critical to addressing the complex nature of such transitions. The consortium brings together world-class communities in modelling and political and social science to build a common story. Between the modelers, the project embraces a large diversity of models, featuring different paradigms and specificities, which allow the project to cover a wide range of socio-economic aspects. It also provides for global assessments in parallel to country-level ones. The political and social science body embraces the branches of economics, development studies, political economy, international relations and international law and politics. This represents an enormous methodological challenge, but also a great opportunity.

In order to realize this multidisciplinary in a practical way that is policy-relevant, the consortium of COP21 RPPLES establishes narratives. These narratives are built to allow the different tools and bodies of knowledge to “tell the same story” from their respective perspectives, which together can provide a comprehensive, consistent but also granular vision of the different aspects of the transformation. In short, it is a framework that helps the research consortium to articulate a common language.

**Figure 1** illustrates the different aspects that the common narratives tie together: the physical transformation, the international climate governance and the socio-economic implications and enabling conditions. Largely based on sophisticated modelling tools, Work Package 3 (WP3) of COP21 RPPLES explores the socio-economic implications of different physical transformations in the world. It studies competitiveness, trade, energy security, employment and GDP in different scenarios. It also looks at the financial system’s role in decarbonizing the different sectors of the economy. For the same physical

transformations, largely characterized at sector-level, Work Package 4 (WP4) scrutinizes the governance needs to bring them about.



**Figure 1** General framework for the establishment of common narratives under COP21 RIPPLES project.

As per design, a given narrative consists of a set of qualitative information that characterizes the context in which these interactions happen as far as 2050. These narratives are valid at the project level and are not constrained by the parameters that particular models may need, for example. Each of them serves a function in drawing out specific research findings. Methodologically, the different research teams will translate the narratives into scenarios or a set of characteristics that talks to their analysis, in a way that makes sense for their respective tools and discipline. The translation of narratives into scenarios can only happen at individual research team-level because the specificities they need differ significantly from each other.

With hindsight, the operationalisation of the narratives has evolved over the lifetime of the Project. There have been three main stages: (1) development of narratives as starting point for a joint conversation, (2)



translation of the narratives into specific research streams and individual deliverables, and (3) consolidation of final narratives that draw from the multi-disciplinary research results.

- (1) Development of narratives as starting point for a joint conversation:

The resulting narratives are presented in Section 5 of this document, namely driven by the collective work to identify and prioritise policy questions, as well as developing a structure and method of the individual research workstreams to respond to these questions. This work was represented in the first version of this Deliverable (D2.1, version June 2018)

- (2) Translation of the narratives into specific research streams and individual deliverables:

This is the work that each of the research teams has done in the context of individual deliverables across WP3 and WP4 to translate the generic narratives into specific guiding research questions. For some of the work, for example the model-based analysis, this has involved the characterisation and quantification of certain elements of the narrative. This was done independently by different teams, depending on their expertise on the specifics of the research topic and the work and tools needs, thus, there is no harmonised fully-fledge characterisation of the final narratives.

- (3) Consolidation of final narratives that draw from the multi-disciplinary research results:

With the delivery of the different research pieces, and critically, the joint discussions on results hold during the last Project & Stakeholder Meetings and the two Policy Dialogues, a final set of narratives has emerged. These narratives continue to constitute a framework for a common language. Rather than telling different or complementary transition stories, they highlight important aspects of the transition to low carbon societies in a multidisciplinary way. The resulting narratives are presented in Section 6 of this document.

## 2.1 Co-design nature of the Project Narratives

The Project Narratives were co-designed over the lifetime of the project thanks to the engagement of the entire Consortium in its development. This was mainly done during the face-to-face Project Meetings,

Consortium-broad review of the report D2.2 prior to its initial deliverable, and numerous conference calls at deliverable- and policy-brief-levels. The co-design was extended to external stakeholders as a result of the main engagement activities: Stakeholder Meetings and Policy Dialogues. The table below summarizes the type of interaction with Consortium partners and external stakeholders in the context of the Project Narratives, and therefore, in the context of facilitating multidisciplinary outcomes.

	<i>Discussion &amp; Stakeholders</i>	<i>Output</i>
Second Project & First Stakeholder Meeting (June 2017)	The objective of these initial meetings was to collect insights at Work Package level about the respective research ideas, tools and plans. This information would be used to develop an initial proposal on Project Narratives. There was a specific session to further discuss the concept of the Narratives and its role in the Project.	Better understanding of WPs perspectives on the research ahead and links with the current policy landscape.
Third Project & Second Stakeholder Meeting (April 2018)	The focus of these two meetings was on the co-productions of the Project Narratives themselves (with Consortium partners and External Advisory Board members). The discussions were structured around actual policy debates and main questions to be considered by policy-makers. External stakeholders made a call for the Consortium to play a role in reducing the gap between ambition & implementation by explicitly connecting narratives with short term decisions, and techno-economic analysis with observable realities. See D5.6 & D1.4	D2.2 (original deliverable) & decision on first multidisciplinary brief “Sectoral Approaches”
EAB regular call – focus on Project Narratives (October 2018)	Based on the reflections held during the half-term review, a conference call was organised with the EAB members to provide feedback on current narratives and necessary adjustments given the developments within the Project and the policy landscape.	-
Fourth Project & Third Stakeholder Meeting (May 2019)	For the first time, preliminary research results were discussed face-to-face within the entire Consortium and a limited number of stakeholders (both External Advisory Board members and high-level representatives of DG Clima). It became a first test for the Project Narratives. On one hand, the results discussion was organised per topics across WPs in response to the Narratives. On the other hand, there was a dedicated session to regard “current NDCs” versus “Enhanced NDCs” (i.e. the final Narrative on timing) in the EU given	Draft multidisciplinary policy brief on EU ambition that makes the case for early action & decision to develop multidisciplinary briefs on finance,

	the recent launch of the EC long term vision. EC high-level representatives provided direct feedback to early drafts of the related policy brief. See D1.5 & D5.7	industry and governance.
First Policy Dialogue (June 2019) – Brussels & Bonn	With regards to the use of Project Narratives, it basically replicated the discussions held during the Third Stakeholder Meeting on EU long term strategies with an extended audience of stakeholders from different constituencies (NGO, private sector, associations, EC and think tanks & academia). Much feedback was collected to continue developing the storylines underlying the Project’s research questions and to complete the EU ambition policy brief. See D5.8	Final multidisciplinary policy brief on EU ambition
Second Policy Dialogue (October 2019) – High-level round table & Policy Dialogue	This Dialogue was conceived to discuss policy insights emerging from our multidisciplinary work in the areas of finance, industry and governance. This work facilitated the discussion on the narratives with the highest ambition (proxies of 1.5C) and different forms of international cooperation and leadership with a larger number of (mainly Brussels-based) stakeholders. See D5.9	Final multidisciplinary policy briefs on Finance, Industry and Governance & necessary material to consolidate final narratives for the completion of this report.

### 3 Framing the policy questions

Prior to the definition of the basic characteristics of these common narratives, a selection of the central policy questions needs to be made. Ultimately, the application of the narratives has to generate insights to precisely answer these policy questions. In other words, the narratives are meant to grow into policy recommendations as the research advances on the multiple fronts.

Our starting point is the COP21 outcome. In 2015, the PA established a quantified goal with regards to mitigation of climate change through two main articles. Article 2 defines the Long-Term Temperature Goal on two levels: holding temperature “well below 2°C” and pursuing the 1.5°C limit. Article 4 agrees on the peaking of global emissions as soon as possible and rapid reductions thereafter so as to achieve “balance” in 2<sup>nd</sup> half of this century. This “balance” implies carbon dioxide removal (or ‘negative emissions’), and some remaining non-CO2 and some CO2 emissions (Shaeffer, 2018). The PA requires countries to take on successively more ambitious efforts through their Nationally Determined Contributions (NDCs), and to be



held accountable to implementing them. Article 4.3 puts in place a ratcheting mechanism for ambition as a crucial principle for the revision of NDCs (Oberghassel, et al. 2015, Waisman, et al. 2016): ‘Each Party’s successive nationally determined contribution will represent a progression beyond the Party’s then current nationally determined contribution and reflect its highest possible ambition.’

Given the widely recognized inconsistency between the first round of NDCs in 2015 and the collective “well below 2C” climate objective, the role and effectiveness of the ratchet mechanism along with the process to take stock periodically of the collective efforts are of great consequence. The Talanoa Dialogue, originally denominated as the “Facilitative Dialogue” under the PA, is the first collective stocktaking process. Under Fijian leadership, a first technical phase took place last May. It seemed to have created an atmosphere of openness, empathy, optimism and urgency, whereas its potential to be translated into actual commitments from countries to present revised NDCs by 2020 and increase their ambition remains open to question (Vallejo, 2018). There seems to be an unresolved struggle between the rhetoric of the need for going further faster and the practical means to achieve it – including evidence to inform short-term policy decisions. This applies to ambition and action alike.

COP21 RIPPLES wants to contribute to the understanding of the concept ‘going further faster’ with a focus on the energy systems. The contribution of the analysis conducted in COP21 RIPPLES to each policy question should be twofold: what does it precisely mean, and how to do it. The first question has to do with the interest by stakeholders and policy-makers in understanding the governance and socio-economic implications of meeting Paris goals, and the choices that will make a difference in our economies. The second one recognizes the need to swiftly move into meaningful implementation. This requires sector-by-sector information on both the physical transformation and the enabling conditions (physical, institutional and political). This also demands a better understanding of the transition from competition to collaboration approaches, in a context of different capabilities and levels of ambition. These new collaborations will have a global impact on institutional arrangements, technology and investment, which in turn will have a social and economic effect, featuring the connection between both questions.



COP21 RPPLES will systematize the policy debate according to three overarching questions which underpin the ‘going further faster’ goal:

- I. What are the advantages and disadvantages of increasing ambition in the short term?
- II. What does it mean to pursue efforts to limit to the 1.5 goal?
- III. What are the implications of specific countries and/or sectors cooperating to take the lead?

Next, we elaborate on each of them.

### 3.1 What are the advantages and disadvantages of increasing ambition in the short term?

The PA requests Parties to submit new or updated NDCs by 2020. The new or updated NDCs should represent an increase in ambition. Nevertheless, the first Talanoa Dialogue session held in May 2018 showed that despite positive intentions, there is still little concrete indication of the plans to prepare and submit revised NDCs by key players, including the EU.

A key reason for this lack of preparation may be that players are not convinced that an early revision of ambition is in their interest. Major reasons behind this include fears of the costs and distributional impacts of accelerated action and the temptation to bet on breakthrough technologies to ‘solve’ the issue in the longer term. In this line of thought, and assuming the world is committed to the PA, the question that emerges is what would be the conditions to remain ‘Paris compatible’ even if following a current NDC path to 2030. **Sticking to the scale of ambition of current NDCs** would force dramatic acceleration of decarbonization processes after 2030. Is this plausible given the existing governance landscape and historic technology learning rates? Are current ambition levels sufficient to foster technological progress in the longer term?

Alternatively, the expected **increase of ambition in revised 2020 NDCs** raises complementary questions: what would be the rationale for pursuing rapid transitions? Is there a social and economic case for higher ambition by 2030 in Europe? In addition to the grounds for higher ambition, the international community is rightly concerned about the ‘how to’. Policy-makers need to be informed of the short-term mitigation



choices and strategies that align with an optimized path to meet the long-term climate goal of the PA. It is also necessary to identify and capture action where it is running ahead of the policy envisioned in the NDCs. Critically, ascertaining the enabling conditions for higher ambition today would enable Parties, and the EU specifically, to better understand the transition scenarios ahead.

This international debate mirrors that in Europe. Today, there is a lively discussion on the revision of the EU's 2030 objectives. Whereas some countries publicly state that the EU has to increase mitigation efforts to be in line with the PA<sup>1</sup>, several others, mainly those who strongly depend on coal and gas, are voicing their views on the difficulty in starting their transitions towards a low-carbon world. Energy ministers are negotiating higher renewables and energy efficiency targets for 2030 in the context of the Clean Energy Package and the Governance Regulation.

### 3.2 What does it mean to pursue efforts to limit to the 1.5 goal?

The 1.5C goal was included in the PA as the result of a concerted push by an alliance of vulnerable States, including the LDCs, SIDS and the Independent Association of Latin America and the Caribbean (ECBI). The Agreement further characterised the temperature goals of «well below 2C» and 1.5C by indicating the need for rapid peaking of global emissions and reaching net-zero emissions as early as possible during the second half of the century. The 1.5C limit translates into much tighter carbon budget up to 2050 compared to the «well below 2C» one. Back in 2015, the lack of information about the feasibility and costs of 1.5C-compatible pathways led to mandating the IPCC to develop a 1.5C Special Report. This is scheduled to be approved in October 2018.

Today, the size of the 1.5C challenge is known to some extent at global level. The necessity of an acceleration of the development and diffusion of very low emission solutions and large-scale transformations of all sectors is indisputable. The speed of decarbonization required exceeds all historical experiences (Michaelowa et al, 2018). It also implies the need to consider net negative emissions, which

---

<sup>1</sup> See <https://www.euractiv.com/section/climate-environment/news/seven-eu-countries-call-for-stronger-climate-action-in-europe/>



could include the emergence of Negative Emissions Technologies (NET) and the associated governance concerns for some of them. The findings of the IPCC 1.5C Special Report have enormously contributed to the understanding of these pathways. Specific implications relevant to the energy systems have been summarized in COP21 RPPLES [Deliverable D2.3](#).

The size of the challenge is generally less known at national-level. The key differences between the 1.5C-compatible and the 2C-compatible levels of ambition are still unclear, let alone their economic implications. Besides, policy-makers notably confront a ‘how to’ question. What are the critical long-term considerations that require today’s attention at national level to be in on a 1.5C pathway? And nonetheless, are we creating an enabling environment to capitalize on the opportunities that the transformation of our economies will bring? At international-level, are we creating an enabling environment to make sure that the 1.5C goal remains within reach, for example, in terms of infrastructure development or governance?

Particularly for Europe, Heads of State and Government triggered a process to explore what would make the EU’s 2050 vision ‘Paris-compatible’, providing an opening to acknowledge that current efforts are insufficient, and negotiating the inclusion of a 2050 neutrality target. The European Commission is expected to publish the EU long-term climate strategy, also called the new 2050 Roadmap, in November 2018, and most Member States are working on their national strategies. Important questions on growth and competitiveness remain unresolved, and the rapidly changing assumptions on technology and political developments need to be considered to update the evidence base which informs European policy-makers. For example, with a phase-out of coal-based power generation and of internal combustion engines now deemed politically feasible (Marcu & Zachmann, 2018), what would be the role of CCS in Europe in different 1.5C scenarios?

### 3.3 What are the implications of specific countries and/or sectors cooperating to take the lead?

Climate policy has always been characterised by different levels of ambition among Parties, sectors or organisations (Grubb, 2018). At national level, and while the Kyoto Protocol was governing, this was



reflected in Annex I versus non-Annex I and differentiated targets, with a narrative of leadership by industrialised countries. However, the economic and political realities did not align with this and became increasingly divergent (Grubb, 2018).

The PA became the first universal climate change agreement to spell out precise, substantive, legally binding mitigation obligations on all countries (Obergassel, et al., 2015; Waisman, et al. 2016). The aspiration for universal participation and the mirage of moving to equalised efforts in global action, while indispensable, prevented serious analysis of, or political development of, ways to support regions of greater ambition. This is often reinforced by the economic narratives of ineffectiveness, adverse competitiveness impacts & carbon leakage (Grubb, 2018).

Similarly, international climate governance tradition textbook analyses present climate change as a collective-action problem prone to free-riding at the level of states (Barrett, 2011; Keohane & Victor, 2016; Luterbacher & Sprinz, 2001) and do not commonly reflect that conditions in different sectors and societal sub-systems differ considerably. Energy-intensive industries differ starkly from international finance and investment or the buildings sector when it comes to barriers to decarbonisation and related opportunities. Such differences should be taken into account when thinking about the need for and potential of international cooperation. And such a more differentiated analysis, notably through a sector perspective, promises considerable insights into how the “complex” of international institutions relevant for the fight against climate change could and should be further developed.

Essentially, the ‘bottom-up’ and evolutionary nature of the PA immersed in a polycentric international governance landscape, fundamentally recognises the reality of differing levels of ambition. The Article 6 of the PA refers to the need and sets a basis for cooperative actions between countries seeking to move from NDC ambition towards the actual overall ambition of the Paris climate goals (Grubb, 2018). Key questions are whether and how such countries and associated actors can cooperate, and how much could they thereby achieve? Importantly, how can international governance contribute to this? What are the key governance functions to be fulfilled in for these differing sectoral systems by means of international cooperation (international institutions) to contribute to decarbonisation? What challenges and



opportunities emerge for the ‘members’ of the coalition, notably in finance and innovation? And what is the potential to overcoming barriers to decarbonisation. In particular, what are the critical gaps in international governance that the EU could fill in, and what can be the associated benefits of playing such a role?

## 4 Initial narratives to explore different transition stories

This chapter develops the narratives that were developed to answer each of the three main questions identified above. The order of the narratives presented in this document do not necessarily represent a sequential order to their implementation.

First, COP21 RPPLES establishes a set of narratives that investigates the differences in the time profile of emission reductions over 2010-2050 to meet the Paris goals. It examines the implications of accelerating ambition by 2030, and therefore, it aims at directly informing the review of NDCs in 2020. These are:

### 1. From NDC ambition to Paris compatibility

In this narrative, global climate action remains on the current NDC path until 2030, i.e. 2030 global emissions reach the level close to the aggregation of all the current NDCs. The global emissions level and underlying policy interventions and technological choices where these are explicit in current NDCs determine the GHG emissions path until 2030. From 2030, the global community takes measures to meet the Paris goal. Noting the requirement from the PA to increase the ambition in each round of submissions of NDCs, this story practically becomes a theoretical baseline. It will identify the challenges to meet Paris goals in the case of little or deceptive acceleration of ambition in the next round of NDCs in 2020.

### 2. Increased 2030 ambition to Paris compatibility

In this narrative, there is an acceleration of climate action in the short term (pre-2030) compared to the level of emission reduction that would be expected from the implementation of today’s NDCs. This leads to a smoother emission path to 2050 to keep the door open to meeting the Paris goals. This



narrative reveals the potential measures to take in the short term to go beyond current NDCs, as well as the enabling conditions for it, whether in terms of finance, technology or governance aspects.

Considering the central role that the decarbonisation of energy systems globally plays towards achieving a low-carbon future, these two narratives represent scenarios with structural differences regarding the trends of energy efficiency and decarbonization of energy used. These are measured by the rate of energy intensity of GDP and the carbon intensity of energy for 2010-2030 and 2030-2050 respectively, and will effectively become constraints in the modelling of these scenarios.

A key difference between the two narratives is that carbon intensity of final energy decreases by -22% by 2030 in the “Increased 2030 ambition to Paris” path, while it remains almost constant in the other narrative, highlighting that the current set of NDCs feature very little effort on the decarbonization of energy. Both narratives coincide in the fact that slow action in the short-term does not provide significant incentive to accelerate research and development on these new technologies, therefore preventing a massive scale-up after 2030. Therefore, the challenge in the period up to 2050 remains on the radical change of the energy intensity of the economic activity, which is strained to the limit for the “From NDC ambition to Paris” narrative.

Through the governance lens, these two narratives cater for different levels of effectiveness and adequacy of the role of the UNFCCC and its NDC review process, as well as other institutional actors at international level. In the first narrative, the ‘ratchet’ mechanism to enhance ambition, together with the Talanoa Dialogue and the Global Stocktaking processes do not sufficiently perform. The functional gaps of the PA governance mechanisms have not been filled by the conglomerate of existing institutions. In the second narrative, the governance is adequate to the transformation required in the key sectors that can make a difference in the short term.

Moving on from the previous narratives, the next transition storylines focus on the extra mile to meet the tighter carbon budget associated with 1.5C, and importantly to reach adequate benchmarks to achieve full decarbonisation at global scale. Compared to the previous ones, where the focus was on short term



acceleration of ambition, here the emphasis is the **long-term perspective to inform the short-term action**. The two narratives that will be assessed are:

### **3. Technology-driven transformation to 1.5C**

This narrative represents the case where ambition is increased compared to previous scenarios largely driven by technology deployment. Technology penetration rates and their geographical diffusion are brought to maximum acceptable levels to meet the 1.5c goal. It includes the introduction of new technologies, also those considered disruptive. This narrative also incorporates technologies that are able to deliver negative emissions, although these are not discussed in detail. It will highlight the main challenges associated with high reliance on a range of technologies, potential bottlenecks and necessary enabling conditions. It will also tell the story of macro-level economic implications of this choice.

### **4. Behaviour-driven transformation to 1.5C**

This narrative has the same level of ambition than the previous one but pursues a different profile of the mitigation effort, where possible. It gives a more prominent role to behaviour changes, along with technology deployment. It actively explores changes in the profile of the demand of energy and resources. Changes in behaviours, mindsets and lifestyles play a central role, which in turn influence requirements for technology deployment and evolution of costs (these lifestyles could include e.g. lower red meat consumption resulting in lower pressures on land and agricultural emissions, post-materialist value shift ...). As a result, new Net Emissions Technologies (NETs) play a less important role to meet the 1.5C.

These two narratives are expected to provide distinct and complementary insights. On one hand, the technology-driven path will test the required rates for technology development. Coupled with the research on technology learning curves and countries' competitive advantages, this will inform the size and nature of the policies and investments on research, development and diffusion of technologies to match the 1.5C challenge. The assessment of competitiveness will inform the choices on technology. As technology development, innovation and deployment will largely happen across national boundaries, a suitable



technology-focused international governance landscape will be required. Lastly, this narrative will point out potential gaps in the implementation governance of few NETs, where concerns are growing in the public debate (Michaelowa et al, 2018).

On the other hand, largely instigated by the possible challenges emerging from the technology-driven narrative, the second narrative will push the envelope of standard demand profiles to incorporate radical changes in behaviour that are typically dismissed. It will discuss those changes that are often difficult to integrate in existing modelling frameworks. It will discuss those changes that may require a multi-level governance effort to reach out to 'society' & other functional arrangements to enhance behavioural switches. The analysis of gaps in the governance landscape will generate insights about the plausibility of this scenario. The analysis of the social and economic effects (GDP, employment, income distribution, trade) of behaviour changes may give a different picture of the 1.5C challenge.

Therefore, COP21 RIPPLES has to investigate the effect of differentiated levels of ambition: the potential of different cooperation approaches, how to mobilise them through international governance and the advantages and disadvantages for the cooperants. According to the results emerging from the assessment of the scenarios representing all the above-mentioned narratives (NDC to Paris compatibility, Increased 2030 ambition to Paris compatibility, 1.5C driven by technology, 1.5C driven by behaviour changes), our research will pay careful attention to a combination of sector-based and regional cooperative approaches. The specific coalitions will address these sectors and/or regions that face greatest challenges in the transition to low-carbon societies, and will be informed by the analysis of gaps and opportunities of the international governance landscape, taking into account that at least one of the following conditions should be met:

- Sector-based cooperation where accelerated innovation can generate an economic surplus
- Country- and/or sector-based cooperation that is likely to attract investment according to the finance sector developments
- Country- and/or sector-based cooperation that can offset carbon leakage against clean tech diffusion



- Country-based cooperation where there is firm commitment with highly ambitious targets (i.e. full or nearly full decarbonisation)

Two narratives will anchor the case-studies analysis:

##### **5. Sector-based strategic cooperation to drive domestic ambition**

Under this narrative, specific sectors cooperate in different ways that allow them to create a favourable environment for their own transformation. The derived scenarios will identify gains in economically attractive mitigation action and/or governance structures that allow for smoother decarbonisation for specific sectors compared to the previous scenarios.

##### **6. Coalitions to maximise global ambition from Europe**

This narrative describes a transition characterised by certain cooperation approaches that allow Europe to leverage the greatest acceleration of ambition at global scale. It is focused on the potential role of Europe to accelerate the transformation globally – either through changes in production or consumption, or other diplomatic and international relations tactics that could have an effect on the international governance landscape.

In short, a total of six narratives were structured to guide the analysis under COP21 RPPLES to respond the prioritised policy questions. Figure 2 illustrates this framework.

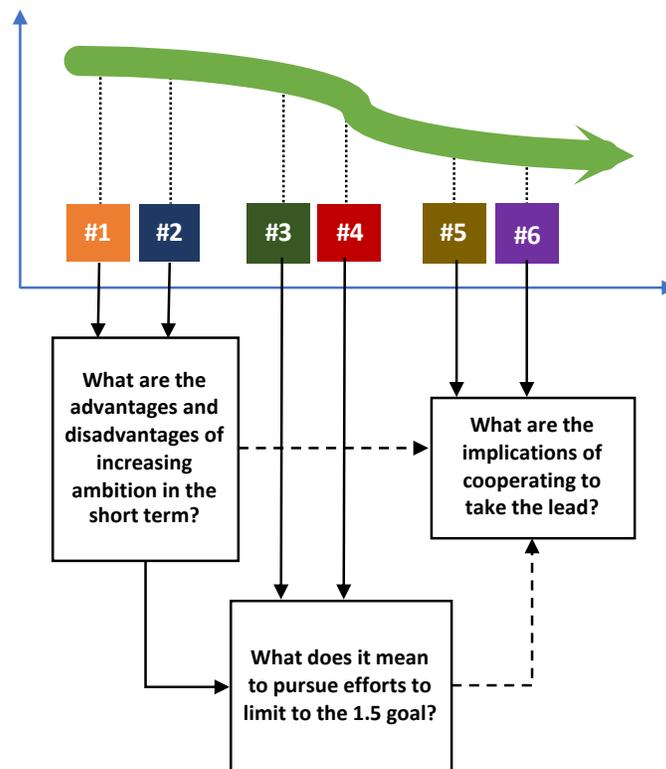
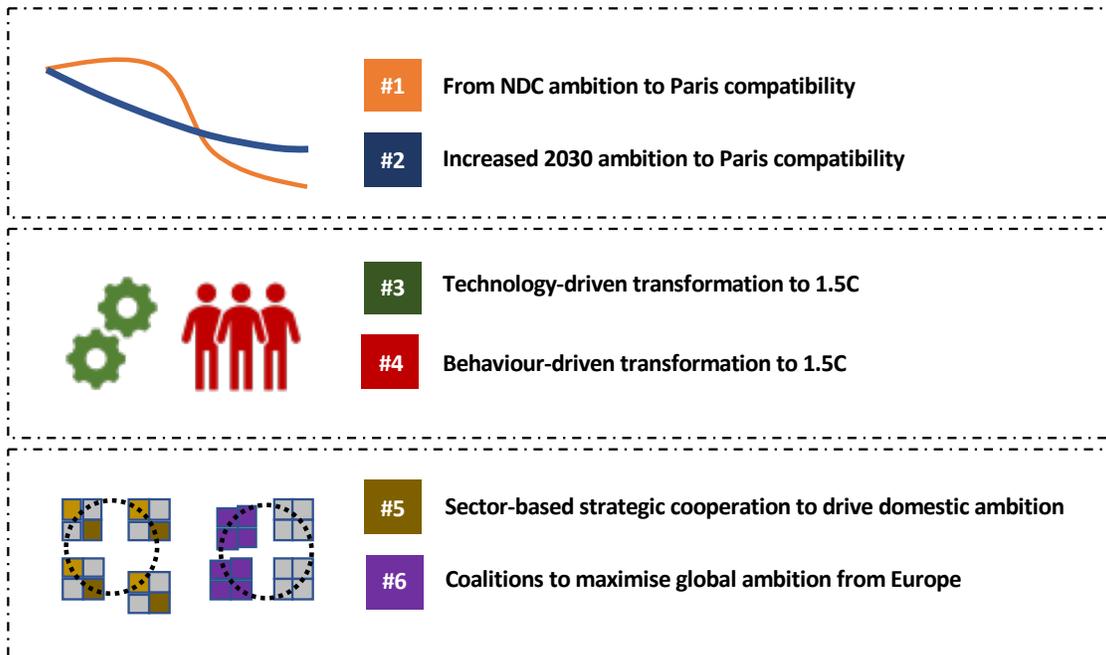


Figure 2: Overview of COP21 RPPLES narratives coupled with the project’s focus policy questions.



## 5 COP21 RIPPLES global scenarios characterization

New national and global GHG scenarios were produced under COP21 RIPPLES Project by some of the consortium partners, which can be accessed at the IIASA repository (<https://data.ene.iiasa.ac.at/cop21ripples>). These scenarios are not conceived as an output of the project rather a methodological tool to answer specific research questions according to the Project Narratives. The scenarios were developed by different teams and different tools bearing in mind the limitations of the respective modelling frameworks. To note, that the focus of COP21 RIPPLES is on energy systems only, and therefore the discussion of pathways in terms of temperature goals should be cautiously handled. In this section, we explain how the global scenarios were characterised along with the evolving discussion on Narratives.

<sup>2</sup>“With the review of existing global scenarios (June 2018), the launch of the IPCC 1.5 SR (October 2018) and the public release of the scenarios underpinning this Special Report (December 2018), benchmarks for “Paris-compatibility” for GHG energy system-only scenarios were derived. This would allow for the in-house development of global scenarios. It was defined by meeting a carbon budget in the range of 1.000-1.100 GtCO<sub>2</sub> for energy CO<sub>2</sub> emissions (rounded to nearest 50) for the 2010-2050 period.

The initial narrative of ‘Paris compatible scenarios following NDC path, where countries follow a pathway similar to a full implementation of the targets and strategies included in the current NDCs until 2030, while they accelerate action after 2030’ became the so-called ‘Current-NDCs’. Its global emissions level in 2030 (CO<sub>2</sub>-energy emissions only) to be established between 36 and 40 GtCO<sub>2</sub>, which represents the level of global ambition of the set of NDCs submitted to the UNFCCC. The global ‘Current NDC’ scenarios do not represent individual NDCs, but the global emissions level estimated to be reached if all NDCs are met. According to IPCC SR15, such level of emissions in 2030 is out-of-the range for “no- and low-overshoot” 1.5°C scenarios. The ‘Paris compatible scenarios with early action’ category was renamed as “Enhanced-NDC”. As described above, ‘Enhanced NDC’ is set to have the same carbon budget than ‘Current NDC’ in

---

<sup>2</sup> This is an extract from Deliverable D2.1 (confidential) of COP21 RIPPLES

2010-2050 but emissions level in 2030 are lower than the global NDC benchmark (between 24 and 26 GtCO<sub>2</sub>a) a result of earlier action, approaching 2030 emissions levels in low-overshoot 1.5°C pathways assessed in IPCC SR1.5 as explained in its SPM.

Next the Consortium discussed the categories of ‘Paris compatible scenarios with technological and behavioural disruptions’ and ‘1.5°C compatible scenarios, where countries implement very deep decarbonisation strategies, that brings them on a pathway towards the 1.5°C-related benchmarks. The ‘Paris compatible scenarios with technological and behavioural disruptions’ narrative became rather obsolete given the constraints of the models and the findings from IPCC SR 1.5 pointing to the need of unprecedented changes across the board. From a policy perspective, it had been found useful to distinguish narratives from “technology-driven” and a “behavioural-driven” perspective as they were expected to provide distinct and complementary insights. Thus, the efforts were redirected to understand better 1.5C pathways energy systems, adapting our terms to the IPCC SR. It was decided to relate, as a matter of proxy, the ‘technology-driven’ narrative with scenarios in the range of P3-P4 illustrative pathways from IPCC SR1.5, and ‘behaviour-driven scenarios with scenarios in the range of P1-P2 illustrative pathways. The derived parameters from this can be found in Table 1.

**Table 1: Parameters for 1.5C compatible scenarios under COP21 RIPPLES**

(GtCO <sub>2</sub> ) Cumulative = rounded to the closest 50 Yearly = rounded to the closest unity			<b>P3-P4 range</b>	<b>P1-P2 range</b>
CO <sub>2</sub> emissions from Energy and Industry processes	Cumulative CO <sub>2</sub>	<b>2010-2050</b>	900 - 1100	800
	Milestone emissions	2030	23 - 36	17 - 19
		2050	6 - (-4)	3 - 2
Total CO <sub>2</sub> emissions (incl AFOLU)	Cumulative CO <sub>2</sub>	<b>2010-2050</b>	1000 - 1200	850
		2018-2050	700 - 900	500
		2030	24 - 38	16 - 19
		2050	4 - 1	3 - 2
Kyoto-GHG emissions	Milestone emissions	2030		25 - 30

Source: Own elaboration. The numbers are based on emission levels of the four illustrative pathways (P1, P2, P3, P4) of the IPCC Special Report on 1.5C as provided by © IAMC 1.5°C Scenario Explorer hosted by IIASA <https://data.ene.iiasa.ac.at/iamc-1.5c-explorer> .

The experimentation with the development of 1.5C scenarios (energy emissions only) following the above parameters provided interesting results. Most of the scenarios previously developed as ‘Enhanced NDC’ would satisfy the conditions of the ‘P3-P4 range’ 1.5C scenarios, notably by relying on BECCS and other negative technologies. Given the models used in the Project had a limited availability of negative emissions technologies, and more importantly, our analysis focus is on the energy systems themselves, this scenario was finally found to be redundant for all, except for the team working with TIAM-UCL. The rest of global 1.5C scenarios developed under COP21 RIPPLES correspond to the ‘P1-P2 range’, which further emphasises efficiency and other demand-side measures along with the deployment of all existing technologies.”

The final set of new global scenarios are listed in Table 2:

Table 2: List of global GHG scenarios developed under COP21 RIPPLES

Model name	Scenario	Institution
ENGAGE	Current-NDC	UCL
ENGAGE	Enhanced-NDC	UCL
ENGAGE	P1-P2 1.5C	UCL
ICES	Current-NDC	CMCC
ICES	Enhanced-NDC	CMCC
ICES	P1-P2 1.5C	CMCC
POLES	Current-NDC (2C NDC)	GAEL/CNRS
POLES	Enhanced-NDC (2C NDC+)	GAEL/CNRS
POLES	<i>1.5C (P3-equivalent)</i>	GAEL/CNRS
POLES	<i>1.5C DA (P1-equivalent)</i>	GAEL/CNRS
TIAM-UCL	Current-NDC	UCL
TIAM-UCL	Enhanced-NDC	UCL
TIAM-UCL	P1-P2 1.5C	UCL
TIAM-UCL	P3-P4 1.5C	UCL
TIAM-UCL	1.7C	UCL



## 6 Final narratives that build bridges

COP21 RIPPLES' objective to crystalize a multidisciplinary dialogue was best represented by the set of policy dialogues and policy briefs that were generated. These are the evidence that the narratives framework was successful in allowing for the exchange and articulation of diverse inputs and building bridges among disciplines. Based on these outputs, it is possible to consolidate a final set of narratives. These correlates, with no surprise, to the main elements to address when exploring transition scenarios:

- I. **Narratives of timing:** WHEN matters, it does so for from a physical transformation perspective (NDC pathways are incompatible with the PA), from a social and economic perspective (learning and innovation requires time), and from a governance perspective (the current response is found to be insufficient to match the PA goals, including from the finance sector).
- II. **Narratives of transformation:** HOW is critical to understand the feasibility of meeting the PA in the long term. Only strategies that are robust and normative to reach net zero emissions around 2050 can meaningfully inform the short term. Robust strategies are found to be those that put at the centre the social and economic dimensions of a given context.
- III. **Narratives of leadership:** WHERE action is taken first and by whom (which countries, regions, or subnational authorities, which sectors, or which constituencies) has an effect on the evolution of the physical transformations, the socio and economic consequences, and notably how international cooperation is understood and orchestrated.

These narratives can be found through the individual research deliverables, but particularly in our multidisciplinary policy briefs. The following table provides an overview of key messages in these briefs to serve as an illustrative example of the work to consolidate these final narratives, but it is not meant to be a comprehensive overview of key insights:

Table 3: Mapping policy briefs along with COP21 RIPPLES Project Narratives

	<b>Narratives of timing</b>	<b>Narratives of transformation</b>	<b>Narratives of leadership</b>
<a href="#">Sectoral approaches</a>	Critical: Gradualness of pathways between 2020-2030, both physical & socio-economic implications	Drivers of transformation for structural changes	Governance gaps differ from sector to sector
<a href="#">Learning for decarbonisation</a>	Reduced decarbonisation costs induced as a result of 'learning by doing' not just R&D investments	Generation of economic opportunities at domestic level	Not all countries can specialise in all low carbon technologies
<a href="#">EU ambition</a>	Optimising 2030 target	Strengthening the role of industrial and finance sectors	EU international agenda as an asset for domestic ambition
<a href="#">Industry</a>	Short term requirements (infrastructure, policy and regulation)	Understanding deep decarbonisation in hard to abate sectors	International sector-level decarbonisation clubs
<a href="#">Finance</a>	Role of the finance sector, as a stand-alone system and as an enabler in the short term	Transforming the finance system versus sustainable finance	Prominent role of regulators along with financial actors
<a href="#">Adequacy assessments</a>	Essential articulation of short and long term perspectives	Need for a comprehensive framework to assess adequacy of the responses	EU as a role model to assess progress and establish multi-governance level effective structures

It is important to note that these final narratives are not considered an output itself, just a tool that allowed the multidisciplinary approach.



## 7 References

- Grubb, M. (2018) A Second Narrative – a world of unequal ambition (and action). Presentation at the Second Stakeholder Meeting of COP21 RPPLES Project. Warsaw, 2018. Available at: [www.cop21ripples.eu](http://www.cop21ripples.eu)
- Marcu, A. and Zachmann, G. (2018) Developing the EU Long Term Climate Strategy. Policy paper. © Bruegel, ICTSD - ERCST 2018
- Michaelowa, A., Allen, M. & Sha, F. (2018) Policy instruments for limiting global temperature rise to 1.5°C – can humanity rise to the challenge?, *Climate Policy*, 18:3,275-286, DOI: 10.1080/14693062.2018.1426977
- Obergassel, W., Arens, C., Hermwille, L., Kreibich, N., Mersmann, F. Ott, H.E. & Wang-Helmreich, H. (2016): Phoenix from the ashes: an analysis of the Paris Agreement to the United Nations Framework Convention on Climate Change. Part I: Environmental Law & Management, Vol. 27 (2015), No. 6, pp. 243-262. Part II: Environmental Law & Management, Vol. 28 (2016), No. 1, pp. 3-12.
- Shaeffer, M., (2018) On quantitative assessments of Paris Agreement Art 2 & 4 aims. Presentation at the Second Stakeholder Meeting of COP21 RPPLES Project. Warsaw, 2018. Available at: [www.cop21ripples.eu](http://www.cop21ripples.eu)
- Vallejo, L., Levaï, D. Talanoa Dialogue : a positive kick-off but an uncertain outcome. Blog post on May 10<sup>th</sup>, 2018 on [www.iddri.org](http://www.iddri.org). Available at: <https://www.iddri.org/en/publications-and-events/blog-post/talanoa-dialogue-positive-kick-uncertain-outcome>
- Waisman, H., Torres Gunfaus, M., Spencer, T., Marquard, A. Emerging from Paris: Post-2015 process, action and research agenda. Series paper at © IDDRI/MAPS 2016