

# Towards 1.5°C-consistent next Paris NDCs: a comparison between Italian and Swiss transport decarbonization perspectives

Valentino Piana\*

October 2018

## Abstract

The IPCC Special Report on 1.5°C pathways has been requested by the UNFCCC to contribute to the Talanoa Dialogue and to frame the increase in ambition of the next wave of Nationally Determined Contributions (NDCs) under art. 4 of the Paris Agreement. The corresponding significant decrease in short-term emissions - in a way that irreversibly drives the system towards (near) zero emissions - might tentatively be estimated in the order of magnitude of a fall of 9% per cent per year and would require the contribution of all sectors, especially those still locked in by fossil fuel complementarities across consumer habits, products, services and infrastructure, such as transport. From the vantage point of being a participant to Swiss scientific efforts to map the transition, the author compares the Swiss strategies and perspectives with what emerged in Italy, including the 2030 Sustainable Mobility Roadmap and the Energy National Strategy, in the consultation phase of which he took part in 2016 and 2017. In particular the legal values are analyzed, while concluding with a few insights for advancing research and achievements.

**Keywords:** Swiss Energy Law, Total revision of CO2 Law, Italy's National Energy Strategy, sustainable mobility, mitigation policies, 1.5 degrees of global warming, emission pathways

**JEL Codes:** Q54, Q48, R48

## 1 From the Talanoa Dialogue to the next wave of NDCs

Since Durban UNFCCC COP in 2011, internationally agreed texts have been recognising the gap between what the science requires for stabilizing temperatures and total pledges of the countries<sup>1</sup> (at the time deriving from the Copenhagen Accord and the Cancun Pledges, nowadays including the Intended NDC and the current NDC). The Paris Agreement identifies and activates the mechanism to close the gap, which will have a non-linear dynamics, with errating

---

\*Corresponding author. Research Associate at HES-SO Valais / Wallis. Email: valentino.piana@hevs.ch

<sup>1</sup>“Noting with grave concern the significant gap between the aggregate effect of Parties’ mitigation pledges in terms of global annual emissions of greenhouse gases by 2020 and aggregate emission pathways consistent with having a likely chance of holding the increase in global average temperature below 2 C or 1.5 C above pre-industrial levels... decides to launch a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all Parties” (p. 1, Decision 1/CP.17) - <https://unfccc.int/resource/docs/2011/cop17/eng/09a01.pdf>.

positive and negative surprises (including new scientific evidence, evolution in models and approaches, changes in government attitudes and policies, technological innovation, social change, ecc.). The Agreement will accompany the XXI Century quests for decarbonization, adaptation, and management of “loss and damage”. For the moment, this mainly means implementing the current NDC - and the complementary documents covering goals and activation beyond mitigation - in a way that early successes can feed higher confidence for further investments and provide sound bases for societal consensus, with full recognition of all the actions taken by non-governmental stakeholders and agents, including those highlighted by the Global Climate Action and the NAZCA portal [13, 4]. Concurrently, the same decision to which the Paris Agreement is annexed<sup>2</sup> called for a Facilitative Dialogue in 2018 for framing the update of NDCs. What could have been a simple session at a COP has become, thanks to the impetus of Fiji Presidency of COP23, a full-fledged reflection, baptized Talanoa Dialogue, on “where we are”, “where are we going” and “how to get there”, with more than 220 specific texts produced<sup>3</sup>, started in January 2018 as technical phase and targeting COP24 for the political phase, which, in author’s opinion, should set a level for the average (or cumulative) ambition increase<sup>4</sup>. The next wave of NDC should:

- be in line with long-term low-emission development plans that indicate a target year for total (net) zero carbon emissions (net carbon neutrality);
- highlight policies characterized by the kind and scalability that would allow for total (net) zero carbon emissions;
- provide clarity and incentives for the participation of the private sector, civil society and research community, both domestically and in international cooperation.

## **2 Why a yearly emissions reduction of (at least) 9% is key to remain in the 1.5°C carbon budget**

The Talanoa Dialogue is a narrative process with a hard core constituted by science, embodied in the process of writing, reviewing and finalising the IPCC Special Report on 1.5°C impacts and pathways, and the background peer-reviewed and grey literature [5]. Although the general reference is to “best available science”, it’s clear that the Report is an eminent part of it: the key messages and figures coming out in October 2018 will be exerting a fundamental role for communicating the risks and the opportunities in limiting temperature increases to 1.5°C, as called by the goal review envisaged by the Copenhagen Accord (point 12) and as included in the Paris Agreement, with a numerical target that complements the “well below” 2 degrees target - which is a fundamental piece in the many compromises that allowed the Paris Agreement. All this makes any national policy or plan nominally targeting 2 degrees illegal after the ratification and the entry into force of the Agreement. In other words, countries should plan in line with 1.5°C trajectories, leaving to implementation delays and difficulties the room to manifest themselves without endangering the “well below 2 degrees” objective. The newly computed remaining carbon budget for 1.5°C is 570 gigatonnes (of CO<sub>2</sub> emissions after 1 Jan 2018) under a reference scenario of proportional fall for non-CO<sub>2</sub> emissions. In such case, simple computations show that a reduction of 9% each year of the global emissions of CO<sub>2</sub> would permanently maintain the world within the budget: given current emissions of about 42

---

<sup>2</sup>Decision 1/CP.21.

<sup>3</sup>For a preliminary analysis, see [15]

<sup>4</sup>Indeed the second draft of the COP24 Presidency text explicitly reported the -45% target for 2030 global emissions contained in the Special Report. This reference has been deleted in the final text.

Gt, their systematic reduction would, starting from a certain date in the future, widen each year the number of years remaining to the budget exhaustion, what means that this menace would be forever gone. Depending on the year when this reduction begins, there is more or less room for policy implementation failures and delays. Please note that any scenario with large negative global emissions implies a more than 100% reduction of emission in the year where positive emissions translate into negative and extremely large rates also in the adjacent years (so any attempt to say that 9% is unfeasible would automatically lead to the same judgement for overshooting trajectories). In other words, a carbon budget framework leads to emphasising total cumulative emissions over time, in some shift from the exclusive attention paid to the headline promised reduction in a far future year. We propose to add an yearly percentage reduction target, both because of its abovementioned consequences and because of the the communicational power in setting a simple and verifiable benchmark<sup>5</sup>.

### 3 National and sectoral examples of past and future emission reduction at the required scale

A perspective of net zero emissions challenges any attempt to concentrate the reductions in a few sectors and segments. If one had to reduce total emissions by 5%, a discussion about in which country and in which sector that would be easier and less expensive may be relevant. But if the target is zero, then obviously all countries and sectors need to be involved<sup>6</sup>.

A 9% yearly reduction is high and challenging but it already occurred in many sectors and countries, for very specific years and often in a reversible dynamics, for which after a large fall a large rise greatly re-absorbes the achievement. In quantitative terms, at national level, all sectors included, a fall equal or larger than 9% occurred 1052 times in a dataset of 216 countries and yearly data from 1959 to 2014 containing 12074 non-empty values<sup>7</sup>. In other words, it occurred 8.7% of the time - a small but not negligible percentage.

The main empirical reason for such emission reduction is a deep economic crises with absolute fall in GDP, which is an extremely painful way to achieve it – and generates the widespread interest and commitment in reversing it.

Thus the key is to introduce sectoral changes that decouple GDP and emissions, reframe mitigation not as a cost but as a benefit, by making reduction a business and not a contraction of profits, investments and jobs, happiness, consensus and votes. Policies that embed and fulfill such positive vision were presented in Piana et al. (2009) [9] and have been explored in seminars to policymakers of different sectors over the years, e.g. [10, 11, 12]. This explains the involvement of the author in several policymaking processes in the countries where he works: Italy and Switzerland.

#### 3.1 The transport decarbonization perspective in Italy

Since June 2016, the Prime Minister Office has been coordinating a stakeholder consultation, including key ministries, to share scenarios and explore policy options for sustainable transport, partly in response to EU policy papers, partly to develop the national interest in identifying

---

<sup>5</sup>Every individual country, company, or household would use this headline figure to localise and evaluate its efforts and results, with deviation from it subject to justification in terms of the CBDR principle (common but differentiated responsibilities and relative capabilities), enshrined in the Framework Convention and reiterated by the Paris Agreement.

<sup>6</sup>The presence of the qualifier "net" to the zero perspective should not be mislead and be over-emphasised: forests and absorbing technologies may well give some contribution but their upscale to cover significant fractions of global emissions is extremely hard, expensive, and likely conflictual.

<sup>7</sup>Source: our elaboration on Global Carbon Budget (2015) data by LeQuéré et al. [7]

and supporting industries and employment, initially under the title of “Roadmap della mobilità sostenibile fino al 2030”. The author of the present paper was involved in most meetings and paperwork of this process, within the delegation of Legambiente, the only environmental NGO participating. We produced a 1.5C-consistent pathway for the sector, with a 86% emission reduction by 2030, by cutting in half of the number of vehicles (today standing at some 37 millions) and by their total substitution with zero emission fleets (both private and collective, including car-sharing, car-pooling and taxis), leading to a higher occupancy rate. This scenario relies on the implementation of 44 specific proposed measures, a selective overview of which is in the Appendix. The technical assistance of the policymaking process was supplied by RSE, through meetings, presentations and several successive drafts of the main document, collating the solicited contribution of the rising number of participants, which grew over time because of the perceived importance of the process, with a meeting in the Green Room in Palazzo Chigi having exhausted entry pass because of such high number. The document was finally released under humbler title of “elements towards” the Sustainable Mobility Roadmap [18] and by separating policy recommendations that, instead of being signed by ministries, were signed by a list of willing stakeholders, a sort of a new coalitions, all heated exchanges and differences notwithstanding. The list includes many car producers, as Toyota, Renault and several others, with the notable exception of Fiat / FCA. Publication of our scenario was done as a chapter in the book edited by Poggio (2018) [16], which collects a state-of-art review of technological, social, economic and political insights and policy suggestions. Transport was an element of the broader National Energy Strategy, approved in 2017 at the end of a participatory process, to which the author participated with a submission of his own [14]<sup>8</sup>.

### **3.2 The transport decarbonization perspective in Switzerland**

In 2012-2015, the national overall Energy Strategy 2050 was consulted, published and approved, setting a goal of zero climate impact after 2050. The most controversial issue, though, was the nuclear power utilization which, together with hydropower, makes electricity sector of the country largely emission free, but whose environmental impact (and renewal costs) were at the end assessed as requiring exit. The debate evaluated the relative importance of domestic and foreign production by renewables as well as energy efficiency and absolute reduction of energy services. This was, at least in part, channeled into a new Energy Law, voted by the parliament and subject to popular referendum, which confirmed it (with 58.2% of votes in an election characterised by a 42.89% participation). The 2017 Energy Law is ambitious in the sense that it indicate a target of widely increased renewable production (with different figures for water- and non-water-based production) as well as an absolute reduction of total electricity use, which compels a radical increase of electricity efficiency and possibly de-electrification. For transportation, logically following this law, the main emphasis should be on non-motorised transport and people-centric policies to increase the use of public transport, possibly without expanding its supply. Electrification of vehicles, which indeed in 2012 were considered as necessary in representing 30–75% of the total fleet (Prognos, 2012) [17], should be accompanied by measures reducing other uses of electricity or, in our interpretation, the use of the grid (e.g. self-production at household and factory site, vehicle-2-home exchanges, energy autarky communities, etc.). More in general, the law itself, implicitly recognizing the challenges in implementation, reserved a fairly large amount of resources to fund cutting-edge research, including through a network of newly created Swiss Competence Centers for Energy Research. Among them, the SCCER CREST is in a sense attributed the social aspects of the transition, aims at providing detailed, evidence-based recommendations on policies that help to reduce energy demand, foster innovation, and increase the share of renewables in a cost-efficient way

---

<sup>8</sup>For a broad overview of more than 30 submissions is at <http://www.accordodiparigi.it/energia.htm>

and is preparing a White Paper on the Swiss climate policy [20]. After the Paris Agreement, a large-scale consultation has been launched about the possible ratification by Switzerland, culminated with the decision to proceed, actuated on the 6th October 2017. An earlier NDC was submitted to the international community, targeting a 50% reduction of total emissions by 2030, mainly to be achieved domestically but with a part also in foreign countries. In line with the current NDC a total revision of the CO<sub>2</sub> Law of 2012 has been envisaged, with a draft text published in 2016 and a “Botschaft” by the National Council issues in December 2017. Measures in the proposed law include higher floor for CO<sub>2</sub> taxes and, for transport, the compensation of fuel-due emissions with importers’ paid projects, mostly abroad. Broadly speaking, the law frames mitigation as a cost but takes no steps to increase the profitability of innovators and early adopters, which might then be the effect of further regulations and activities. In this debate, SCCER CREST is bringing together economists, engineers, computer scientists, sociologists, psychologists, and other experts to cover in a wide way both the system-level opportunities and specific policy measures for the transition. In particular, a Joint Activity with SCCER Mobility is analysing the socio-economic aspects of the evolution of mobility. In order to provide a flexible but powerful tool for scenario building and policy comparison, especially in terms of effectiveness, an agent-based model of mobility demand is being developed by a team the author is leading, under the overall coordination of Prof. Dr René Schumann. BedDeM (Behavior-Driven Demand Model) implements a broad range of psychological, sociological and economic factors influencing the decision making of individuals. It can be in principle be applied to any demand choice, while currently expanded and crafted in the direction of modal choice at trip level with a number of realistic features reflecting Swiss realities, e.g in terms of demography, income, vehicle ownership. This model, in conjunction with three others (STEM, MATSim, SWISSMOD), will provide elements for discussing decarbonization trajectories [6, 3, 19]. In particular a recent paper (Bektas et al., 2018) is being laid out about people-centric policies aimed at increasing the demand for railways services, given the same supply (thus indirect emissions) [1]. The preliminary results are encouraging: policies acting on emotions of non-users of rail are quite successful in inducing a shift from fossil-fuelled cars to railway – in a context where a wide range of modal choice are available, according to territorial specificities. This suite of models will be in the near future applied to evaluate the role of electric vehicles and non-motorised transport and in general of the diffusion of innovative sustainable transport services, thus contributing to the debate on how to implement the current NDC and how confident to feel while updating it.

## 4 Comparing Italian and Swiss transport decarbonization perspectives

The two countries share targets of large absolute reduction in emission as well as all the uncertainties surrounding when and how to update those goals, with a significant scientific and political discussion about the best way to do it. However, in terms of the process of the National Energy Strategy and the 2030 Roadmap, Italy framed the strategies not so much as directed towards an act of the Parliament but rather as ministry-led consultation experiments where non-state actors were selectively invited, could speak out, but whose input could be easily discharged, with a final text that, in the case of the Roadmap, was signed not by the government but by the stakeholders themselves. Its legal value is obviously weak, relying on parliamentarians to be willing to adhere and interpret those recommendations. All this in a critically fragile political situation, where elections, governments and coalition programmes are mutually intertwined, with radical changes always promised, which in turn tends to hinder the value of long-term planning. By contrast, in Switzerland the consultation phase gave way to an actual

Law (in both the energy and the CO<sub>2</sub> domains). The legal value is high – and the fact that a full popular vote followed is a guarantee of stability. This prominently impacts on funding for implementation the measures (both in terms of actual hard investments and research on them), which is significantly higher in Switzerland than in Italy. Conversely, perhaps the more “chaotic” approach in Italy might allow for faster introduction of novelties, at the cost that they are not mainstreamed, though. As possible insights for advancing research and achievements, one might recommend to support interdisciplinary research clearly targeted to achieve excellence and well-crafted strategies that combine high decarbonization with attention to social and political aspects. The private sector and civil society should be able to play an important role in implementing the Paris goals, with clear incentives for doing so. In general, it’s true that for all countries the Paris Agreement is challenging because it departs from Kyoto and requires on-going update of goals for the same year, implementing mitigation, adaptation and finance on domestic and international cooperation levels<sup>9</sup>. However, as the threats of climate change are materializing in more and more dangerous ways, the interchange of experiences for a decarbonization that in all countries covers all sectors provide a wide room for synergies and additional value added.

## 5 Acknowledgements

This work arose in the strand of research generated by the Joint Activity “The Evolution of Mobility: a Socio-Economic Analysis” by Swiss Competence Center for Energy Research CREST and SCCER Mobility. The author gratefully acknowledge the financial support by Innosuisse to the Joint Activity. Needless to say, the opinions expressed are of the author only.

## 6 Appendix: An overview of measures to decarbonize transport presented as input to the Italian Roadmap 2030

As described in the main text of the paper, the author elaborated several proposals to promote the fulfillment of the 1.5°C scenario included in the Italy’s “Elements for a roadmap” [18]. Some of them were included in the “Stakeholder Recommendation for a Roadmap of sustainable mobility” [2]. Others were not and rather contributed to the book “Green Mobility” and its related alliances [16]. Here we offer a selection of such measures:

1. package of advantages (such as free public transport subscriptions, minutes of car-sharing, etc.) to those families that scrap an ICE car, in order to reduce the overall motorization rate;
2. a national architecture of promoting and funding the most radical local mobility plans, with additional advantages for those who live in there;
3. parking spaces reserved to car-sharing and electric vehicles; in closed paid parkings, these spaces could be free, implicitly or explicitly paid by ICE vehicles;
4. bonus-malus systems, providing a money subsidy to the purchase of electric vehicles, paid by a small tax on ICE ownership, with very wide exemptions for lower and middle income families.

---

<sup>9</sup>For scenarios for transport sector decarbonization of each country in the world compatible with 1.5°C limitation, see [8]. For a global report on decarbonization trajectories and policy measures see [21]

5. promote charging stations at job sites, shopping venues, cinemas and hotels, including by including the presence of charging in the definition of a 4-star hotel;
6. incentivize the presence of electric vehicles in taxi fleets, including by connecting to their regulatory framework;
7. stimulate car-sharing systems in smaller centres and at condominium level.

## References

- [1] Alperen, B., Nguyen, K., Piana, V., Schumann, R.: People-centric policies for decarbonization: Testing psycho-socio-economic approaches by an agent-based model of heterogeneous mobility demand. Accepted for presentation at CEF 2018 (Milan) conference (2018)
- [2] BMW, AIPARK, CEI-CIVES, Renault, COBAT, Legambiente, et al.: Raccomandazioni degli stakeholder del tavolo mobilità sostenibile (2016), [http://www.minambiente.it/sites/default/files/archivio\\_immagini/comunicati/20170524\\_rse-raccomandazioni\\_roadmap-edit-6\\_1.pdf](http://www.minambiente.it/sites/default/files/archivio_immagini/comunicati/20170524_rse-raccomandazioni_roadmap-edit-6_1.pdf)
- [3] Horni, A., Nagel, K., Axhausen, K. (eds.): Multi-Agent Transport Simulation MATSim. Ubiquity Press, London (Aug 2016). <https://doi.org/10.5334/baw>
- [4] Höhne, N., Kuramochi, T., Gonzales-Zuñiga, S., Sterl, S., Graichen, J., Healy, S., Siemons, A., Kersting, J., Wachsmuth, J.: Climate initiatives, national contributions and the paris agreement5. Working Paper presented at UNFCCC SBI 44 (2016)
- [5] IPCC: Global Warming of 1.5 C, an IPCC special report on the impacts of global warming of 1.5 C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty (2018)
- [6] Kannan, R., Hirschberg, S.: Interplay between electricity and transport sectors – integrating the swiss car fleet and electricity system. *Transportation Research Part A: Policy and Practice* **94**, 514 – 531 (2016). <https://doi.org/https://doi.org/10.1016/j.tra.2016.10.007>, <http://www.sciencedirect.com/science/article/pii/S0965856416307248>
- [7] Le Quéré, C., et al.: Global carbon budget 2015. *Earth System Science Data* (7), 349–396 (2016). <https://doi.org/10.5194/essd-7-349-2015>
- [8] Piana, V.: Implementing Paris: which more ambitious Nationally Determined Contributions can promote innovation in the transport system with sufficient urgency to contribute to 1.5°C-consistent global greenhouse gas emission pathways. University of Oxford Conference - 1.5 Degrees: Meeting the challenges of the Paris Agreement (2016)
- [9] Piana, V.: Innovative economic policies for climate change mitigation. Economics Web Institute (2009)
- [10] Piana, V.: Innovative economic policies for climate change mitigation. 65th Peccei Lecture – Club of Rome – EU Chapter (Bruxelles) (2009)
- [11] Piana, V.: Policies for the green innovation system and the role of territorial concentration. Training Program for the Ministry of Science and Technology of the People’s Republic of China, held at Beijing (2012)

- [12] Piana, V.: How to push the fastest possible diffusion of eco-innovations: policies and examples in emerging strategic industries. Training Program for the National Development and Reform Commission of the People's Republic of China, held at Turin (2013)
- [13] Piana, V.: From local to global fight for limiting warming at 1.5°C: the role of NAZCA pledges. Presented at SISC Conference 2016 (Cagliari) (2016)
- [14] Piana, V.: Verso lo scenario di policy avanzate: occorrono più rinnovabili e più mobilità elettrica per rendere meno costoso e stabilizzare il sistema, messo a rischio dal mix di gas e PV - Commento alla SEN da parte dell'Economics Web Institute. <http://www.accordodiparigi.it/SEN%20-%20Commento%20Economics%20Web%20Institute.pdf> (2017)
- [15] Piana, V.: Dall'azione pre-2020 all'incremento dell'ambizione dei prossimi NDC, facilitato dal dialogo "Talanoa". Newsletter of the Lombardy Foundation for the Environment (2018)
- [16] Poggio, A. (ed.): Green Mobility, come cambiare la città e la vita. Edizioni Ambiente, Milano (2017)
- [17] Prognos: Energieperspektiven für die Schweiz bis 2050. Energienachfrage und Elektrizitätsangebot in der Schweiz 2000–2050. BFE (2012)
- [18] RSE, Ministry of Environment, Ministry of Economic Development, Ministry of Transport: Elementi per una roadmap della mobilità sostenibile (May 2017)
- [19] Schlecht, I., Weigt, H.: Swissmod - a model of the Swiss electricity market. WWZ Discussion Paper, No. 2014/04, University of Basel, Center of Business and Economics (WWZ), Basel <https://www.econstor.eu/bitstream/10419/123457/1/wp2014-04.pdf>
- [20] Schleiniger, R., Abrell, J., Betz, R., Kosch, M., Piana, V., Stuentzi, A.: SCCER CREST White Paper "Towards the Swiss Climate Policy" - Zur schweizerischen Klimapolitik: Wie effizient ist die Bepreisung des fossilen Energieverbrauchs? (2018), [https://www.sccer-crest.ch/fileadmin/user\\_upload/SCCER\\_CRESCREST\\_White\\_Paper\\_6\\_Klimapolitik.pdf](https://www.sccer-crest.ch/fileadmin/user_upload/SCCER_CRESCREST_White_Paper_6_Klimapolitik.pdf)
- [21] SLoCaT: Transport and Climate Change Global Status Report 2018. [http://slocat.net/sites/default/files/slocat\\_transport-and-climate-change-2018-web.pdf](http://slocat.net/sites/default/files/slocat_transport-and-climate-change-2018-web.pdf) (2018)