ICAT Initiative for Climate Action Transparency

Photo: Shutterstock

Application of the ICAT Transformational Change and Sustainable Development Methodologies to assess disruptive innovations and behaviours in support of climate action in Argentina

UN environment programme | copenhagen climate centre

ISPRA Istituto Superiore per la Protezione e la Ricerca Ambientale

Sistema Nazionale per la Protezione dell'Ambiente

Authors

James Haselip (UNEP-CCC),
María Teresa Jeffrey,
María Lourdes Manrique,
Diego Padilla.

Reviewed by Randa Ahmed (ICAT), Ivana Audia (UNEP-CCC), Stefanía D'Annibali (UNFCCC), Fernando Farias (UNEP-CCC), Marina Vitullo (ISPRA) and Henning Wuester (ICAT).
Translation and additional inputs provided by James Haselip (UNEP-CCC).

This summary report is based on a longer document (deliverable #14 of ICAT component 2) prepared by Diego Padilla, María Teresa Jeffrey and María Lourdes Manrique (2021).

Available in Spanish - download here: https://climateactiontransparency.org/wp-content/uploads/2021/09/Del-14-Publication-of-Results_website.pdf.

Prepared under

The Initiative for Climate Action Transparency (ICAT), supported by Austria, Canada, Germany, Italy, the Children's Investment Fund Foundation and the ClimateWorks Foundation.

Federal Ministry
Republic of Austria
Climate Action, Environment, Energy, Mobility, Innovation and Technology

Federal Foreign Office
on the basis of a decision by the German Bundestag

IKI INTERNATIONAL CLIMATE INITIATIVE

Environment and Climate Change Canada
Environnement et Changement climatique Canada

Federal Foreign Office

climateworks FOUNDATION

MINISTERO DELLA TRANSIZIONE ECOLOGICA

CIFF CHILDREN'S INVESTMENT FUND FOUNDATION

The ICAT project is managed by the United Nations Office for Project Services (UNOPS).

UNOPS

Table of Contents

Abstract

This paper summarises the findings of analysis completed under component two of the Initiative for Climate Action Transparency (ICAT) project in Argentina, on the potential of Disruptive Innovations and Disruptive Behaviours as a means to achieve climate change mitigation and adaptation targets in the medium to long term, aligned with the Nationally Determined Contribution (NDC) and the National Climate Change Adaptation and Mitigation Plan (2019)[1]. The analysis followed the ICAT Transformational Change Methodology on Assessing the Transformational Impacts of Policies and Actions.[2]

Background and introduction

This paper proposes priority disruptive actions/innovations/technologies for which longer-term planning and/or investment strategies are needed, in order to become mainstream in the economy of Argentina. The supplementary aim is to communicate an example of how the ICAT methodologies can be applied in support of national climate change policy and planning. An initial assessment of the disruptive innovations[3] identified here provides a starting point for climate-resilient and low-emission development planning for 2050, by providing information on experience across nations and the specific barriers and opportunities present in Argentina.

The analysis of mitigation measures can also be used as an input to improve the National System for Monitoring Mitigation Measures, which is part of the Climate Change Information System established in the Law for Adaptation and Mitigation (Law No. 27,520).

Assessment methodology

Disruptive innovations were identified and assessed, following a 5-step process:

- Step #1: disruptive innovations identified through a literature review: initial long list of disruptive innovations drawn up.
- Step #2: a short list of disruptive innovations and an analysis regarding their application in the country were obtained through a validation process based on pre-established criteria agreed with the national counterpart (Ministry of Environment and Sustainable Development).
- Step #3: interviews with national and international experts on the disruptive innovations of the short list. 14 interviews were conducted on the following innovations: green hydrogen, native ecosystems in cities, bioplastics, blockchain, agroecology, and sustainable mobility to assess the applicability of the innovation to the socio-economic context of Argentina[4].
- Step #4: selection of 3 climate change innovations and 2 mitigation measures found in the National Climate Change Adaptation and Mitigation Plan.
- Step #5: the ICAT Transformational Change and Sustainable Development methodologies were applied to the 3 innovations and 2 mitigation measures identified.

[1] http://servicios.infoleg.gob.ar/infolegInternet/anexos/330000-334999/332234/res447-1.pdf

[2] *Transformational Change Methodology: Assessing the Transformational Impacts of Policies and Actions*, Olsen, K.H. & Singh, N. (Eds.) Initiative for Climate Action Transparency (ICAT), Copenhagen: UNEP DTU Partnership; Washington, D.C.: World Resources Institute.

[3] Jehl Le Manceau, L., Farias, F. and Sanchez Martinez, G. (2020) *Disruptive Innovation and Technologies: definitions, criteria and potential relevance for the mitigation of greenhouse gas emissions.* UNEP DTU Partnership Working Paper

[4] The details of the methodology, criteria and assumptions used can be found in deliverables 10 and 11b carried out in the framework of component 2 of the ICAT Argentina Project.

Screening and selection process

The literature survey led to a long list of 48 technological innovations, all with a known and verifiable mitigation or adaptation effect. These were categorised according to whether they were already present in the local economy or not. We understand 'technologies' to also incorporate behavioural changes. The innovations can be considered 'disruptive' when assessed against the core criteria set out under the ICAT project:

- Novel application of knowledge.
- Combines technological and business model innovation to create value.
- Offers novel product or service attributes to consumers or end-users.
- Reduces greenhouse gas emissions, if adopted at scale.
- Disrupts high-carbon practices and associated infrastructures and firms, thus leading to a net reduction in greenhouse gas emissions attributed to the focus sector.

Barriers and limitations in the selection of disruptive innovations

When conducting the survey on innovations, some of the data necessary to perform the analysis was not available. This reflects a lack of extensive real-world experience with some of the innovations, e.g. blockchain technology, which are still relatively new. Therefore, the expert interview data was particularly valuable, to produce profiles and analysis of the 'disruptability' and their appropriateness to Argentina's economy and society. Overall, it should be clarified that the analysis carried out for this study establishes a first approximation to possible criteria to analyse existing disruptive innovations, at the time the study was completed (2020/21). However, both the long list, the case studies and the assessment criteria can be modified or updated, according to changing circumstances and/or national priorities. It is important to note that the long list of innovations is dynamic and does not seek to be restrictive with respect to the selected innovations.

Application of ICAT Methodologies

The ICAT Transformational Change Methodology (2020) applies a multi-criteria matrix where the innovation is evaluated according to the probability of its occurrence and key characteristics. This includes how policies can lead to changes in the system allowing for transformational impacts and those that refer to the scale and sustained nature of the innovation. To produce objective results, the following steps are followed:[5]

- Provide a summary description of the *objective of the analysis* of target technologies or innovations, its geographical coverage and focus sectors.
- Identify the transformation phase, which refers to the social, economic, institutional and political context in which the measure is being carried out.
  Identify political barriers (for example, lack of commitment to find solutions to address climate change), institutional and regulatory barriers (lack of coordination between agencies at the national and subnational level, resistance to new institutional arrangements, among others). Identify technical barriers (for example, lack of availability of maintenance or production equipment), capacity limitations (lack of trained personnel, lack of information, among others), financial and investment limitations (for example, lack of available financing or high costs of low carbon technologies).
- Build and score a multi-criteria matrix.

[5] The detail of how each of the steps was carried out and what assumptions and information were used is found in ICAT component 2 deliverables 12 and 13.

Similarly, the ICAT Sustainable Development Methodology provides a matrix that allows identifying the main SDGs impacts, and the magnitude of the impact, for a given technology or innovation. In the same way as with the Transformational Change Methodology, a series of steps are followed to arrive at the matrix:

- A summary description of the target technologies or innovations, the geographical coverage and focus sectors.
- Identification of impacts and their link with the SDGs.
- Identification of impact indicators.
- Evaluation of the relevance (subjective analysis of stakeholders and decision makers) and significance (directly linked to the magnitude of the impact of the measures in the category of impact evaluated, of an objective nature) of each of the impacts.
- Preparation of the matrix of the SDGs impacted.

For both methodologies, the steps were applied based on available literature, information obtained from interviews with experts and the expert judgment of the consultants.

While the short-listed innovations are more related to one type of technology (for example green hydrogen), all technologies require a change in behaviour on the part of producers and/or consumers. This is a crucial point, as technology adoption (uptake) is one of the main barriers to scaling any given technology, therefore active awareness raising is a necessary complement to more 'traditional' economic and regulatory instruments to enable or incentivise the required changes in attitudes and behaviours.

Summary of disruptive innovations and measures analysed

In order to select the disruptive innovations to which the ICAT Methodologies were applied, the following criteria were defined and applied:

- Access to information
- Applicability in the context of Argentina
- Implementation period
- Legal / regulatory framework
- Mitigation impact and adaptation impact[6].

One of the main criteria for the selection was to take into account the need to evaluate at least one disruptive innovation associated with 'hard' technologies and another associated with behavioural changes.

In turn, for the selection of mitigation measures the National Climate Change Adaptation and Mitigation Plan was used as the starting point since it has planned actions to promote sustainable development, reduce greenhouse gas emissions and adapt to the effects of climate change in the different sectors. The focus is on innovations in the Energy sector and the Agriculture, Forestry and Other Land Use (AFOLU) sector, which correspond to 53% and 37% of Argentina's total GHG emissions respectively, according to the 2016 National Greenhouse Gas Inventory.

[6] This information is explained in greater detail in deliverable 11b.

Table of selected disruptive innovations and measures

Disruptive innovations and measures	General description	Mitigation	Adaptation	International benefits and opportunities	Benefits and opportunities in Argentina
Energy Sector					
Green Hydrogen	Evaluated as a package of actions: in the electricity market, green hydrogen for transport, and green hydrogen for export.	Is an innovation directly linked to technological change and climate change mitigation. Green hydrogen is a technology that does not produce emissions, and allows a greater integration of renewable energy and large-scale power generation.	Regarding adaptation, it is considered that, by allowing energy to be distributed between sectors and regions, Green Hydrogen would act as a buffer to increase the resilience of the energy system.	There is international and national interest in the advancement of this technology, which is widely considered as a fundamental energy vector for the long-term green energy transition. Green Hydrogen stands to increase national energy security and reduce macroeconomic vulnerabilities due to global fossil fuel markets. Regarding the regulatory framework, it is still under development in Argentina.	
Electricity generation from non-conventional grid-connected sources of renewable energy	Based on Law No. 27.1911 (amendment to Law No. 26.190 "National Promotion Regime for the use of Renewable Energy Sources for the production of electric energy") that defines clear targets to increase the share of new and renewable power generation technologies to the electricity grid.	Mitigation measure linked to the energy supply.			Law No. 27,191 establishes support mechanisms that include, among other things, tax incentives and different methods for grid operators purchasing greater shares of renewable energy generation.
AFOLU sector					
Native ecosystems in cities	The maintenance or propagation of native flora and fauna that provide regulatory services, e.g. eco-physiological responses to low air quality, GHG emissions, rising air temperatures, and drought		An innovation related to behaviour change and adaptation.	There are different projects at the international and national level that are being carried out, such as a program to strengthen urban nature reserves, municipal nurseries and 'green life' areas.	It is considered that this innovation would improve the conditions of cities in terms of biodiversity, erosion and flood control, as well as improve urban development to increase the quality of life of the inhabitants.

Disruptive innovations and measures	General description	Mitigation	Adaptation	International benefits and opportunities	Benefits and opportunities in Argentina
Agroecology	This innovation has positive environmental impacts since it would improve the environmental quality of air, water and soil, biodiversity, soil fertility, and resilience to extreme weather events. It has numerous positive social and economic impacts since by improving environmental quality, it improves health and access to healthy food. Being a local and small-scale production system it is relatively labour-intensive, thus can be seen as 'job-positive' innovation.	An innovation related to disruptive behaviour, adaptation and mitigation.		It would imply a paradigm shift in the current production model, towards a more sustainable one that considers and minimizes long-term socio-environmental impacts.	There is a local, national and international interest about this productive system. In the national context, Argentina has a National Directorate of Agroecology and in the region the Latin American Scientific Society of Agroecology (SOCLA) has been created.
Avoided deforestation	This occurs when land that would have been deforested is not, because of a change in policy, funding, actions, goals, etc. To qualify as such, the avoided deforestation needs to be demonstrable and verifiable	Is a measure related to behaviour change and climate change mitigation.		Will enable strengthened governance, management, control and monitoring capacities and values native forests as a good for society, due to the ecosystem services they provide and enables local communities to be strengthened.	Is integral to the National Climate Change Adaptation and Mitigation Plan, and there is sufficient information available to enable in-depth analysis Is based on the Territorial Ordinance of Native Forests, which allocates areas of native forests into conservation categories and seeks to avoid a decrease in the area of native forests in areas of categories I and II, established by the Law No. 26.33112 on Minimum Budgets for the Environmental Protection of Native Forests.

Summary results of multi-criteria analysis

This section presents the results obtained by applying the methodology for each disruptive innovation and mitigation measure. The multi-criteria matrices were prepared based on the ICAT Transformational Change Methodology.

1. Green Hydrogen (GH)

Green hydrogen is becoming increasingly important on the international agenda, positioning itself as a disruptive technology/innovation with high potential to accompany the mitigation objectives necessary to achieve climate goals. However, there is still uncertainty about the advantages and disadvantages of the different technologies and ways of using GH. Similarly, there is uncertainty about the impacts of the possible roadmaps that each country may adopt to promote GH.

Green hydrogen fuel, focusing on the use of wind power in Patagonia

Argentina has significant wind energy resources located in the southern provinces of Rio Negro, Chubut, Santa Cruz and Tierra del Fuego. These sparsely populated provinces contain hundreds of thousands of square kilometres of land and near-shore seabed that can capture strong and stable wind speeds averaging over 9 meters per second[10] . Rapid declines in the cost of large-scale wind turbine technology, combined with signals for strong global demand for 'green' liquid hydrogen fuels in mostly OECD economies, indicates a strategic opportunity for Argentina to utilise its wind energy resources to produce non-fossil hydrogen fuels, for export. This fuel would be produced through electrolysis, which requires large quantities of fresh water, which are also available in most parts of Patagonia.

This longer-term economic opportunity for Argentina is underlined in the IEA's 2019 report on the 'Future of Hydrogen[11]', which states that "...if the right infrastructure is developed, it could be attractive in the future for countries to diversify their economies by exporting low-carbon energy in the form of hydrogen and hydrogen-based fuels..." Globally, the majority of hydrogen fuel is either produced and consumed on-site (around 85%) or transported via road transport or pipelines (around 15%), which wouldn't be a viable option for remote hydrogen production in Argentina. As such, the most likely short-term applications of green hydrogen in Argentina are the industry sector (including fertilizers); transport (including heavy good vehicle and/or ships) and the electricity market (seasonal storage). Further, the IEA adds that if hydrogen is to be shipped to overseas markets the most viable option is to liquefy and transport the fuel as ammonia or in liquid organic hydrogen carriers (LOHCs). However, these conversion and reconversion processes imply higher costs that would require offsetting from significant economies of scale[12].

A major drawback to hydrogen is the need to provide an infrastructure for vehicles. The costs of investing in a new network of hydrogen filling stations is a classic 'chicken and egg' problem, and presents one of the biggest barriers to the diffusion of hydrogen vehicles. However, in the medium term, one of the ways to overcome infrastructure problems is to introduce captive fleets of hydrogen vehicles, especially public transport, which can be refuelled in one location. This is what happened with the EU's Clean Urban Transport for Europe (CUTE) – a 5-year pilot scheme for hydrogen powered buses which operated within nine European cities until 2006. But until a wider network of refuelling stations is created, the lack of infrastructure will continue to hinder the uptake of already existing hydrogen powered vehicles.

Support for hydrogen and fuel cell technology is not only aimed at solving transport problems. While at the moment the cost is still high compared to electric vehicles, it is hoped that hydrogen fuel cells will be able to power a range of electrical appliances – and at different scales – with the key advantage that they are able to store energy in a much more effective way than batteries. At the same time, the large-scale production of hydrogen will potentially compete for primary energy resources with conventional electricity supplies. This will make it more difficult and expensive to generate hydrogen from renewable sources since the energy will have to go through two conversions: wind-electricity-hydrogen, for example.

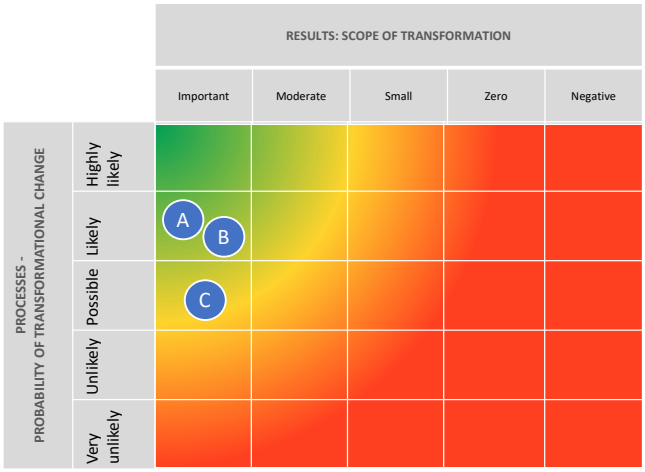
[10] https://globalwindatlas.info/

[11] https://www.iea.org/commentaries/latin-america-s-hydrogen-opportunity-from-national-strategies-to-regional-cooperation

[12] The global market size of ammonia fuel for shipping is approx. 66 x the production capacity of the Intercontinental Energy project in Australia which is tabled to be the largest in the world (which itself is 3 x the generation capacity of the Three Gorges dam project in China): https://intercontinentalenergy.com/. Importance of open source GIS wind and solar maps to identify locations that offer the highest productivity, need for minimum 50% capacity over a 24hr period to keep the electrolysers working.

It is clear from the graphic below that GH offers significant transformational potential, with a high probability of uptake in the electricity generation market ("A") and transport sector ("B"). While in the application of GH for export ("C") is less likely but still possible in the medium term. Across the three application areas there are significant impacts associated with the SDGs, namely SDG8 on decent work and economic growth, SDG7 on affordable and clean energy, SDG13 on climate action, SDG4 quality education and SDG9 on industry, innovation and infrastructure. In the case of GH applied to transport and export, positive impacts were also identified on SDG3 (health and well-being), especially related to air quality.

Green Hydrogen



Sector / application:
"A" (Electricity market) "B" (Transport) "C" (Export)

2. Electricity generation from grid-connected sources of renewable energy

The generation of electricity from non-conventional grid-connected sources of renewable energy is a mitigation measure that represents a possible and positive transformational change for the country and has significant implications in the reduction of emissions. It also has a positive impact on some SDGs, in particular by providing new sources of employment (SDG 8), mitigating the job losses that will likely arise from the decline of hydrocarbon industries that are significant employers in numerous provinces. And increase in the share of on-grid renewables will also have a positive impact across various targets of SDG7[7]. Maintaining progress on this technological transition will require policy continuity and/or updating policies where necessary to prevent Argentina from losing momentum on what it has achieved in recent years.

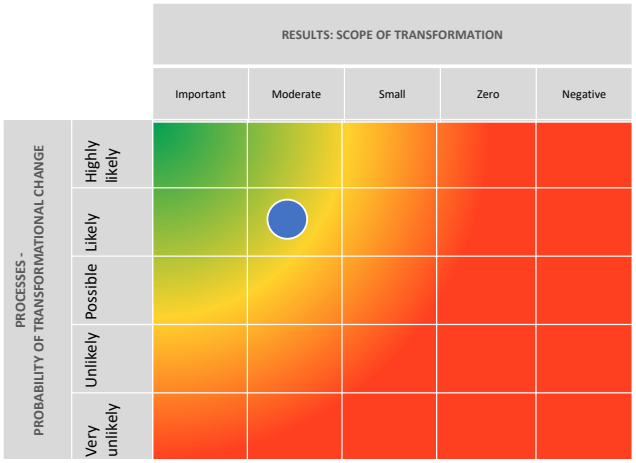
3. Native ecosystems in cities

Based on the results obtained by applying the ICAT methodologies, it is clear that implementing projects that promote native ecosystems in cities is likely to generate a transformational change. To do so first requires creating the necessary incentives for projects to be designed and implemented. In turn, relevant actors - government entities, the urban population, civil society groups, among others - must be involved to ensure that the impact is transformational. On the other hand, greater carbon sequestration will generate an impact in the medium term, while the impact on related SDGs will be generated in the short, medium and long term.

Regarding the SDGs, the propagation of native ecosystems in cities will have a greater impact on SDG3 (health and well-being), due to improved air quality and reduction in the occurrence of heat waves, caused by a better regulation of surface temperatures in cities. In turn, and within the framework of the elaboration of the Long-Term Strategy, it is worth highlighting the positive impact of this innovation in terms of climate change adaptation and mitigation. Native ecosystems can improve the quality of the urban soil, which in turn will increase its permeability, and may contribute to the resilience cities in the face of extreme precipitation events.

[7] For a complete assessment in this regard, see the recently published IPCC Report: Climate Change 2022, Mitigation of Climate Change (Summary for Policy Makers, page SPM-54).

Native ecosystems in cities



4. Agroecology

For agroecology innovation, it is expected that the process of transformation are possible given appropriate incentives, promotional campaigns and investment in research and development. Impacts in terms of greenhouse gas emissions reductions and on the SDGs could begin to be observed, in the medium and long term.

Agroecology offers the biggest potential impact on SDG3 (health and well-being), SDG12 (responsible production and consumption), SDG13 on climate action and SDG15 on 'life on land". The climate change benefits are mostly linked to carbon sequestration and building greater resilience in the system, since these practices would increase the quality of the soil and therefore reduce the risk of erosion. By extension, the improvement in soil quality combined with improved air and water quality will have a positive impact on SDG15. Additionally, agroecological practices promote the biodiversity crops, as well as pollinators and microorganisms in the soil.

Increased consumption of plant-based foods: "Flexitarian" and Mediterranean-style diets and the role of urban allotments in driving this transition

A sustained decrease in meat consumption can deliver significant GHG emissions reductions, in addition to improved personal health and a reduction in associated health care costs. The opportunity to increase in uptake of 'flexitarian' and Mediterranean-style diets in Argentina is significant. According to the OECD, national average beef consumption in Argentina was 38kg per person in 2019, the highest in the world[13].

According to the IPCC Special Report on Climate Change and Land, the global mitigation potential of a flexitarian and Mediterranean-style diets is 5.1 GtCO2e / year and 3 GtCO2e / year, respectively. Further, according to the Emissions Gap Report 2020, published by UNEP, a switch to vegetarian diets offers an average annual GHG emissions reduction potential of 0.5 tonnes per capita, globally. This figure would likely be higher in Argentina, given the high baseline consumption of meat. As such, even a marginal or 50% reduction in meat consumption could offer significant GHG emissions reduction potential, depending on how plant-based alternatives are produced. As such, there is significant scope to explore the potential role and importance of urban allotments in supplying local and low-carbon foods.

In Argentina there are currently no official policies or incentives to reduce meat consumption. As such, any dietary changes occurs due to individual desire, generally driven by factors related to health problems, and an increased concern for the environment and animal abuse. According to the Emissions Gap Report 2020 (UNEP), there are essentially four main ways in which to enable or incentivise changes in diet[14]:

- Legal frameworks: restrict advertising of high-carbon food items, stronger protection of forest land to withstand pressure from cattle ranches; trade policy that ensures sustainable supply chains.
- Economic policies: end incentives for unsustainable food industries and offer support for alternatives.
- Supply chains: influence systems of provision, e.g., better availability of sustainable products (e.g. plant-based alternatives) in supermarkets and retail outlets.
- Social influence: Cultural and societal changes via media.

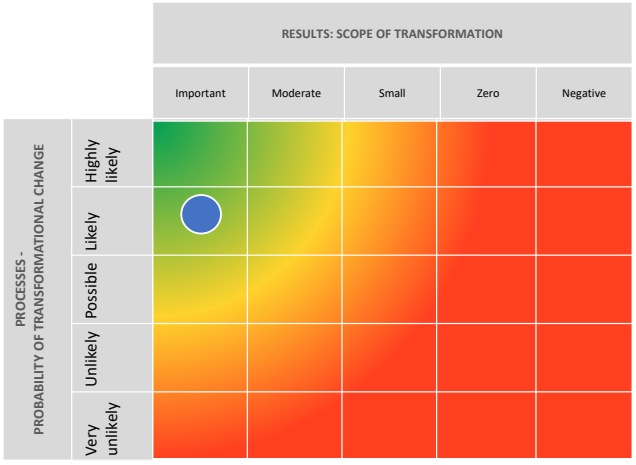
[13] https://data.oecd.org/agroutput/meat-consumption.htm

[14] From the forthcoming chapter on "how can equitable low-carbon lifestyles be achieved? Behaviour change, collective responses, and routes towards rapid policy shifts", due to be published in the Emissions Gap Report in December 2020 (UNEP).

The positive impact of agroecology on rural producers and residents should be highlighted, since less use of agrochemicals of industrial origin would generate less waste that is harmful to the environment. This is a significant concern in Argentina and the diversification of crop production could also provide alternative market opportunities. However, it is important to mention that crop yields could be reduced, mainly in the first years of transition to agroecological practices, which could impact the level of income of producers.

Both the decrease in the generation of waste and the decrease in the application of pesticides and synthetic fertilizers impact not only the above-mentioned SDGs but also SDG12 on responsible production and consumption. This highlights the complexity of this innovation and the importance of pursuing a holistic analysis of its potential in Argentina, in both the short and longer-term.

Agroecology

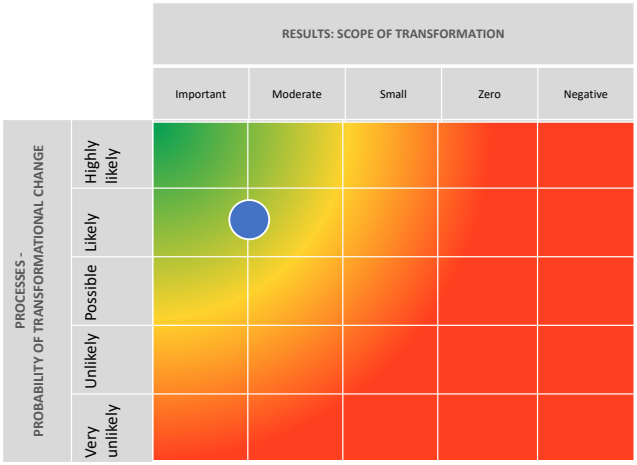


5. Avoided deforestation

Avoided deforestation is expected to be maintained and expanded over time in Argentina. For this to happen, a mix of incentives and technologies must be combined to support and enable the relevant 'change agents'. Here, it is important to highlight positive impacts in terms of SDG 6 (clean water and sanitation), SDG 8 (decent work and economic growth), SDG 13 and SDG 15.

In particular, the impact of avoided deforestation in terms of SDG 15 (life on land) is clear, since the decrease in deforestation implies less change in land use, which improves not only its quality but also biodiversity. At the same time, it is important to highlight the impact of the measure on SDG 8, since the monitoring and management of forest resources requires trained technical teams both at the national and subnational levels. Additionally, the permanence of the forests promotes tourism in surrounding areas, thus allowing the creation of jobs.

Avoided deforestation



Suggested next steps

A detailed analysis of the options to enable or incentivise investment and/or behavioural change is needed for key technologies, in support of a long-term emissions reduction strategy for Argentina.

In order to push the priority technologies forward, it is crucial to first map all relevant local actors that are central to increase their adoption, stimulating the desired long-term change in behaviours. Key information can be solicited from semi-structured interviews with relevant local informants and international experts, in coordination with the designated national authority, e.g. the National Climate Change Directorate of the Ministry of Environment and Sustainable Development. The overall aim should be to

specify actions to scale up these innovations in the short, medium and longer-term. A proposed process can be summarised in the following steps:

- A desk review taking as starting point the results of the ICAT Argentina Component 2 Study of key issues and questions for each disruptive innovation, including status, known barriers, enabling factors and/or possible drivers (such as education, publicity, planned obsolescence, etc.), existing plans and gaps in knowledge etc.
- Identification of key experts and informants for interviews.
- Mapping and characterization of national pilot projects or possible future pilots.
- Analysis of viable 'scale-up pathways' for the adoption of the selected disruptive innovations, taking into account Argentina's context considering:
    - The key risks and barriers to technology uptake and options to overcome them, including possible social and/or political conflict or opposition.
    - Selection of key indicators to measure progress in desired behaviour change, including indicators disaggregated by gender when possible.
    - Estimations of potential GHG emissions reductions, as per the selected indicators, and identification of adequate data sources.
    - Identification and estimation of possible 'rebound' effects and alternative/unexpected effects from wide-spread update of the selected innovations.
    - Synthesis of actionable recommendations for Government and a diversity of stakeholders.
    - Where relevant the economic costs of the technological transition and the available options for financing various aspects of the transition.
- Co-design and help deliver a virtual workshop to present and discuss the results with the National Climate Change Directorate and members of the National Climate Change Cabinet.