The Marin Carbon Project, USA

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Is the project a case of…:

☐ State-initiated co-creation

☒ Entrepreneur-driven co-creation

☐ Grassroots-based co-creation*

**For an elaboration of the typology, please consult the GOGREEN theoretical framework p. 25.*

Integrated case analysis

Before proceeding to the scoring of the GFs, please provide a *3–5 page case analysis* in which you describe the background, history, and national, regional, and local contexts of the case, the problems and goals addressed by the local collaboration, the participating actors and their relationships, the unfolding of the co-creation process, the most important governance factors (this may include factors other than those in focus in this project), and the generated outputs and outcomes. The conclusion may specify a few lessons learned from the case study.

1) Background, history, and national, regional, and local contexts of the case

Marin County is a mixed urban-rural region north of San Francisco that is home to a number of cities and towns, a significant dairy and ranching sector, and an impressive number of local, state and national parks. To understand the context in which the Marin Carbon Project (MCP) developed, it is important to appreciate that, beginning in the 1950s, the agricultural parts of the County faced many growth pressures that in turn produced significant local planning conflicts. At one point, the county passed a zoning law to prevent lots smaller than 60 acres from being developed. This reduced some of the pressures on agricultural land, but conservation and land stewardship groups undertook many additional initiatives to protect agriculture and open lands. Notably, the first agricultural land trust in the nation, the Marin Agricultural Land Trust (MALT), was created and it has used land easements as an effective strategy for protecting agricultural land (55,000 acres). In 1997 and 2010, influential agricultural summits were held to examine how to keep agriculture viable in the wealthy county of Marin. In general, Marin County has a reputation for being open and innovative, but the wealth of many county residents can also generate tensions. Agricultural and environmental politics have also become more polarized over time, eroding some of the County's collaborative spirit.

The origins of the MCP project can be traced to the Nicasio Native Grassland Ranch, who became interested in how to manage their 570-acre ranch more ecologically. In particular, they were interested in developing native bird habitats. Although the ranch was no longer ranching cattle, it had a big weed

problem stemming from historical overgrazing. In 2003, Nicasio Native Grassland Ranch contacted a rangeland ecologist within the Resource Conservation District and Chief Agronomist at the McEvoy Olive Plantation (currently at the Carbon Cycle Institute). The Resource Conservation District and Chief Agronomist told Nicasio Native Grassland Ranch that native grasses were still present on the ranch and suggested bringing back cattle to try to shift the species composition back to native grasses. They started a grazing experiment in 2005 that required moving cattle systematically across the ranch and it produced impressive results, reinvigorating native perennial grasses and making the grassland highly productive. In their earlier studies at McEvoy Olive Plantation, The Resource Conservation District and Chief Agronomist had noted the importance of this productivity for sequestering carbon in the soil.

The Resource Conservation District and Chief Agronomist also suggested that Nicasio Native Grassland Ranch apply PA Yeomen's design for harvesting rainwater and the ranch followed up by buying a Yeomen's plow in 2007. Attending a seminar on how to use the plow, the ranch was inspired by a seminar leader and Australian farm specialist, who claimed that a 1% increase of arable land soil organics could remove all of the carbon in the atmosphere emitted since the Industrial Revolution (a claim from the book *Climate Plan B* and based on a calculation by Dr. Rattan Lal). Inspired by this idea, key stakeholders from the local agricultural and conservation community—including founders of a regional carbon management initiative, a director from the Marin Resource Conservation District, and specialists in rangeland and agroecosystem management—began brainstorming a project in late 2007, conducting a stakeholder analysis to identify crucial participants. They also started thinking about how to develop carbon farming credits.

Nicasio Native Grass Ranch started hosting events to talk about these ideas with various stakeholders like the Executive Director of MALT, who was not that interested at first. The University of California Cooperative Extension Service was also initially skeptical. To proceed further, the group needed to figure out a way to measure carbon sequestration. At the time, the Rathman Family Foundation had also been funding another project studying fecal coliform in Marin streams. That project helped to bring together a group of scientists at Lawrence Berkeley Lab to discuss these ideas and this is where Nicasio Native Grassland Ranch and the ecologist within the Resource Conservation District and Chief Agronomist at the McEvoy Olive Plantation first started discussing the issue with a professor of soil ecology at the University of California, Berkeley.

Around that time, the Climate Solution Act (AB 32) had been passed in California and the Resource Conservation District and Chief Agronomist suggested that they might sell carbon credits to make carbon farming economically attractive. He had found increases in soil carbon content of 12% in some of his test plots after spread of manure. The professor of soil ecology at the University of California, Berkeley was dubious about these claims and, at the time, little was known about increasing soil carbon. To conduct systematic research, the professor needed a baseline soil survey of a range of Marin ranches and their lab conducted a soil analysis of 35 sites on 22 Marin ranches. Gaining access to these farms and ranches was one impetus for the creation of the Marin Carbon project. This early research established that differences in soil carbon content could be distinguished and that ranches that had spread manure on their fields had higher soil carbon content.

With a grant from the Marin Community Foundation, the early group expanded to include the Executive Directors of MALT, Marin Organic, the Marin Resource Conservation District (RCD), the University of California Cooperative Extension (UCCE), and the Regional Director of the U.S. Natural Resources Conservation Service. The group agreed not to start a 501c3 (non-profit) organization because of concerns about competition for funding. MALT and the RCD helped to facilitate site selection and gain access to farms and ranches.

The professor also did some preliminary research and found that Rich Conant at Colorado State University had conducted a meta-analysis that determined that changes in grazing management in America could result in a one metric ton of carbon per hectare increase in soil carbon. Some quick calculations suggested that this amount could have a major impact when aggregated across all grasslands. So, with support from the Rathman Family Foundation and the Marin Community Foundation, the Marin Carbon Project started a study of carbon sequestration in agricultural soils. A key question was how to measure the carbon in the soil so that you could detect a small change. Based on their prior work, The Resource Conservation District and Chief Agronomist suggested adding a ½ inch of compost to the soil (they focused on compost rather than manure because manure creates methane that is 30 times more dangerous for global warming than CO2). They developed two test plots—one on the Nicasio Native Grassland Ranch and Rathman's ranch and another on a Sierra foothills ranch. Results after two years showed that the composted plots grew 30% to 70% more grass, increasing carbon sequestration, while non-composted plots lost carbon. In dissertation research, a Ph.D. student in the Silver Lab, found that more carbon was captured than the amount of compost added, indicating that increased photosynthesis was drawing additional carbon into the soil. The research also found that the addition of compost has a long-term effect. These research findings contributed to the establishment of California's Healthy Soils Program (Source: *Marin Carbon Project Celebrates its 10 year Anniv*ersary).

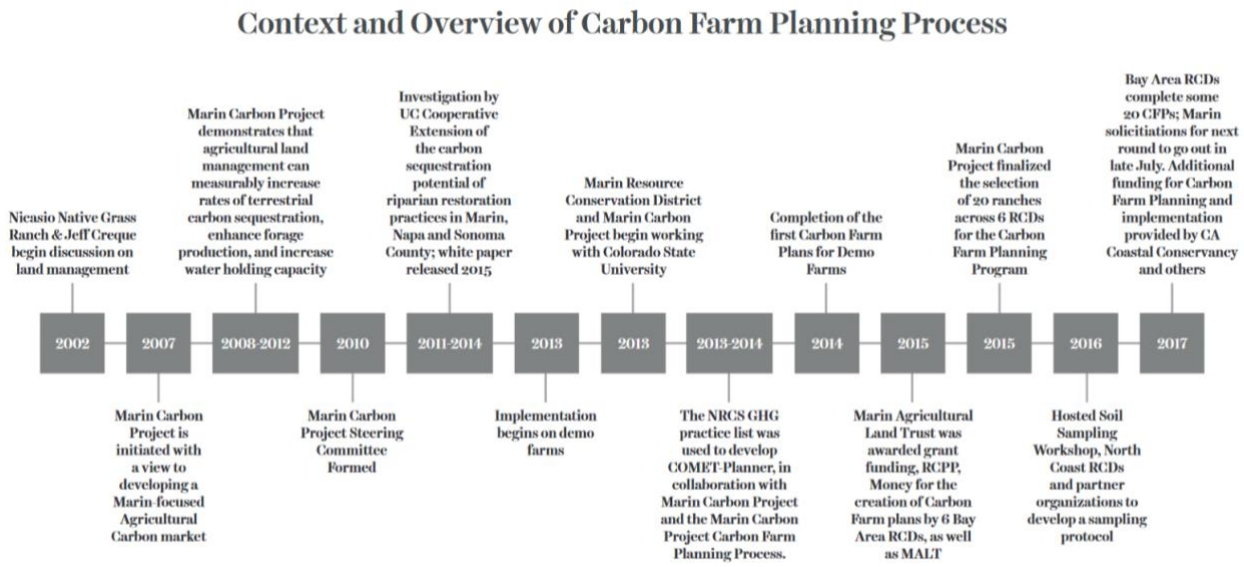
The MCP also developed the idea of carbon farm plans—basically, plans for how individual farms can be managed to reduce greenhouse gas emissions and store carbon. The idea grew out of an interaction between Nicasio Native Grassland Ranch's interest in expanding the compost program, and the rangeland ecologist within the Resource Conservation District and Chief Agronomist's background in conservation planning, and the UCCE and RCD planning and partnership process. As of 2020, the Marin Resource Conservation District had completed 20 Carbon Farm Plans, and $1.5 million in State grants had been awarded to Marin ranchers to assist with the implementation of carbon farming practices across 16 different projects.[1] However, the MCP's hopes for a viable carbon credit market never successfully materialized and the current system of paying for carbon sequestration does not make it financially worthwhile (NB: it may be financially worthwhile in terms of its improvement of farming practices and conditions, but the payments for carbon credits are too low to make them a major incentive for developing carbon sequestration).

Launched in 2008, the Marin Carbon Project celebrated its 10-year anniversary in 2018 (Source: Marin Carbon Project Celebrates its 10 Year Anniversary). After its early successes, the Project struggled a bit to establish a coherent agenda. There were some personality tensions and disagreements about how to go forward and a founding member from Nicasio Native Grass Ranch left the group for a variety of reasons. While important research papers were published between 2013 and 2018, the transition from research to

implementation was tricky. In 2021, the MCP gathered to decide whether it had already achieved what it had set out to do. This strategic planning exercise led the group to decide that it had more to do, and it established a new Charter. This strategic planning process reinforced membership commitment and led to the inclusion of several new members on the steering committee (the Agricultural Institute of Marin and the Agricultural Commissioner of Marin).

A final big picture point is that the influence of MCP has spun out in many directions, blurring the boundaries of where the MCP begins and ends. Nicasio Native Grass Ranch left the group but sought to scale up the lessons of composting to the state and national levels. Working with a managing partner from Terra Regenerative Capital, Nicasio Native Grass Ranch investigated the compost supply chain from production to application. The ranch farm also hired a lobbyist to successfully push for composting policy at the state level, which led to the passage of a statewide composting law (SB 1383). Their work also contributed to creating a national compositing standard. The managing partner from Terra Regenerative Capital took the lessons of the MCP and went on to work with the Jenna and Michael King Foundation on issues of soil health and regenerative agriculture in California, Colorado, New Mexico and Texas, as well as with the Urban Sustainability Directors Network. Fibershed, an organization founded in 2010, sought to bring the idea of "regional fiber systems" together with the MCP's work on composting and soil health. The Carbon Cycle Institute was created in 2013 with the express intent of scaling up MCP's work. Their website claims to have completed 137 farm plans covering 77,440 acres with the expectation of sequestering 1,793,029 metric tons of CO_2e over 20 years (https://www.carboncycle.org/; accessed September 3, 2023).

A good overview the MCP's work is provided by the following timeline:



Source: https://marincarbonproject.org/marin-carbon-project-celebrates-its-10-year-anniversary/

2) The aims of the project and the sustainability problems that it seeks to address

The Marin Carbon Project (MCP) focuses on agricultural management practices that can sequester carbon and reduce greenhouse gas emissions. The MCP seeks to do this through applied research, demonstration, and implementation. Its primary aim is to help Marin farmers and ranchers become better stewards of soil

health in order to promote carbon farming and to enhance farm and ranch productivity and ecosystem function.

In 2021, the MCP (Marin Carbon Project 2021 Strategy + Charter, 2021, 4) published a new strategy outlining four main goals:

•**Goal 1** – "Our top goal is to formulate and support a technical assistance and education framework for the widespread and equitable implementation of climate-beneficial practices on Marin working lands, to meet and exceed the Marin County CAP goals."

•**Goal 2** – "Assess financing mechanisms being deployed in other regions, engage broadly with prospective stakeholders (i.e., producers, grantors, investors, credit developers, etc.), and develop a strategy for the creation of a regional carbon finance initiative."

•**Goal 3** – "Advance agricultural climate change policies and solutions within and beyond Marin County by communicating the model and lessons learned in service of broader agricultural climate efforts."

•**Goal 4** – "Articulate, promote, and help fill a strategic research agenda that (a) elevates and addresses the most important researchable questions pertaining to carbon sequestration on Marin's working lands, and (b) enhances clarity and certainty around the quantification and validation of climate-beneficial land management practices, to help Marin County achieve its climate goals and increase the portfolio of both funding and climate-beneficial land management practices available to agricultural producers."

3) The participants and their interaction and communication in and between meetings

Overview: Early individual participants included Nicasio Native Grassland Ranch, UC Berkeley, McEvoy Olive Plantation, Marin Resource Conservation District, Marin Agricultural Land Trust University of California Cooperative Extension. Organizational participation expanded over time to include the Agricultural Institute of Marin, the Marin Agricultural Commissioner, Marin Organic (no longer exists), the Carbon Cycle Institute (CCI), and the U.S. Natural Resources Conservation Service (NRCS). The Rathman Family Foundation and the Marin Community Foundation were important early funders and and the project is currently coordinated by a Project Coordinator.

Direct citizen participation in the MCP has been quite limited. With the possible exception of Nicasio Native Grassland Ranch, farmers and ranchers have not been included as individuals on the steering committee. There have been "test farms" where farmers such as Don Gilardi, Loren Poncia and Albert Straus were active in MCP projects, but they have not taken a direct decision making role. However, farmers, ranchers and agricultural producers have been institutionally represented on the steering committee through MALT and the RCD, which have strong ties to them. MALT has a requirement that 50% of its board members must be agriculturalists and the RCD Board also includes agriculturalists (interviews). Several interviews discuss the importance of talking directly with farmers and ranchers and of taking their perspectives seriously.

MCP research has been conducted by the Silver Lab at UC Berkeley, in partnership with the UCCE, Colorado State University and other universities.

The RCD, MALT, CCI and the NRCS are responsible for implementation. They engage in direct outreach to Marin farmers and ranchers and provide technical and financial support for carbon farm management and planning.

UCEE, MALT and CCI, work to advance programs and policies at the local, regional, state and federal levels that support farmers and ranchers.

Marin County, particularly its Community Development Department, has been an important bureaucratic actor with respect to the development of County's Climate Action Plan.

We provide a brief description of each of the regularly participating institutions:

Agricultural Institute of Marin (AIM): AIM's mission is "to educate, inspire, and connect communities, responsible farmers, and producers as part of a healthy, earth-friendly, equitable local and regional food system." It operates nine Bay Area farmer's markets (https://www.agriculturalinstitute.org/).

Carbon Cycle Institute (CCI): A nonprofit working at the intersection of climate science and agriculture. The CCI's mission is "to stop and reverse global climate change by advancing natural, science-verified solutions that reduce atmospheric carbon while promoting environmental stewardship, social equity, and economic sustainability" (https://www.carboncycle.org/about-cci/e). CCI advances this mission by providing technical and planning support, training, education, policy development and advocacy.

Marin Agricultural Land Trust (MALT): Created in 1980 by a coalition of ranchers and environmentalists, MALT works to preserve Marin County farmland in order to both enhance the local farm economy and protect the environment. Using land easements, MALT has helped to preserve over 55,000 acres of Marin farmland (https://malt.org/mission-history/).

Marin Commissioner of Agriculture. Marin's Agricultural Commissioner plays a broad role in promoting sustainable agriculture in the County of Marin (https://www.marincounty.org/depts/AG).

Marin Resource Conservation District (RCD): The RCD is a non-regulatory Special District of the State of California founded in 1959 that secures public and private grant money to assist the agricultural community with environmental projects. The Marin RCD works primarily in the watersheds of Stemple, Walker and Lagunitas creeks where it seeks to "bring together state, federal and local agencies with private landowners to bring environmental benefits to working landscapes" (https://www.marinrcd.org/programs/home2/).

Natural Resource Conservation Service (NRCS): Formerly known as the Soil Conservation Service, the NRCS is an agency of the US Department of Agriculture (USDA) that provides conservation based technical

assistance and funding opportunities to farmers, ranchers and other private landowners and managers (https://www.nrcs.usda.gov/about).

The Silver Lab, University of California, Berkeley: Led by Dr. Whendee Silver, the Lead Scientist for the MCP, the Silver Lab studies the response of soil biogeochemistry to management and a changing climate (https://nature.berkeley.edu/silverlab/).

UC Cooperative Extension, Marin County (UCCE Marin): University of California Cooperative Extension (UCCE) works in partnership with the County of Marin. Its mission is to "sustain vital agriculture, environment and community in Marin County by providing University of California research-based information in agriculture, natural resource management, nutrition and youth development." UCCE programs are partnerships between County Governments, the University of California, and the Federal Government (https://cemarin.ucanr.edu/).

4) How often do they meet, and do they communicate between meetings?

The MCP steering committee is the main governing body of the MCP. The current steering committee includes two participants from CCI, along with one representative each from UCCE, AIM, the Marin Agricultural Commissioner, RCD, the Silver Lab, and MALT (https://marincarbonproject.org/about-mcp/#mission-and-vision). In addition to the steering committee, the MCP also has scientific advisory and implementation working groups (the former is not active at present).

The MCP steering committee **meets quarterly** and more often if necessary and the working groups meet as needed. Steering committee members are expected to attend at least 50% of meetings and our interviews suggest that meeting attendance is quite good. One motivation for participating in meetings is to learn from other members. Meetings facilitate information-sharing and the quality of the interaction is generally considered to be quite high. The MCP has established strong norms for proper and constructive member participation, including a formal "Duty of Care" and "Duty of Loyalty." The members have also developed shared expectations about how to deal with funding issues, which can create tensions among the members.

The MCP steering committee members also meet and communicate between the steering committee and working group meetings for the purpose of coordination and organization of various activities and they often participate in the same seminars and conferences.

5) The role and forms of knowledge sharing, coordination and joint problem-solving

N/A

6) The relation between consensus and conflict and the handling of the latter

Interviews generally describe "tensions" rather than "conflicts" in the MCP, with the tensions rooted in the different institutional roles of steering committee members. However, there were some personality conflicts during the middle years of the MCP that may have contributed to the turnover and malaise in the group. We heard a few notes of skepticism about how some participants had worked to advance their own private interests. The steering committee has "worked through" these and other conflicts but expresses

some concern about widening the steering committee because of the additional tension, conflict and loss of control it might entail. From the perspective of the County, we learned that the MCP has been a great partner, but there was some initial friction about how much support the County could or would provide to the MCP agenda.

Our interviews suggest several types of tensions have appeared at various points in time in the development of the MCP. One such tension has been between "getting the science right" and "we know enough, let's get going…." perspectives. As the MCP has developed, there has also been some tension about whether to focus the project narrowly on Marin agriculture or to engage more widely beyond Marin and with consumers. Put starkly, this tension is about whether the group should emphasize the importance of compost as a solution to the climate crisis or should focus on "good and healthy farms" in Marin. Members have different foci: some are more nationally- or even internationally focused, while many are Marin-focused. One interviewee believes that the MCP members have come to a "balance" on this issue and members generally concur that the project is Marin-focused but with important implications beyond Marin.

Most recently, some mild tensions have emerged between founding and newer members of the MCP. Those steering group members who were part of the 2021 strategic planning process feel like "full steam ahead," but some of the newer members are not clear what their role or the agenda is.

7) The role and form of leadership: lead actor, steering group and/or collective leadership

The Marin Carbon Project is coordinated by a steering committee and maintains scientific advisory and implementation working groups (the former is not active at present). The steering committee sets the overall strategic agenda for the MCP, broadly coordinates MCP activities, and liaises with external partners and funders. The working groups engage in more specific activities and coordination around scientific research and implementation tasks (e.g., carbon farm planning). Working group members used to be nominated and approved by consensus by the steering committee, but the procedure is now more informal and based on interests and resources. In terms of models of governance, MCP governance represents what Provan and Kenis call a "shared governance" model.[2] Although Nicasio Native Grass Ranch played a very prominent early leadership role in the MCP, the group evolved toward a more collective leadership style based on consensus. As one interviewee reported "I do think most of our decision-making is in a shared leadership model." However, another interviewee thought that the collective leadership model had become weaker over time and that decisions now reflected the interests of selective institutions.

Although a facilitator and a consultant were hired in the early years of the MCP to help structure the group and its work, the MCP operated for several years without a coordinator. In the most recent period, however, it hired a project leader to help facilitate the group. The project leader helps to facilitate meetings (especially the steering committee meetings) and to keep the agenda moving forward between meetings, in part by helping to manage the process of delegation of tasks to different members. The project manager also operates in a "reconnaissance" role of scoping out emerging issues, and operates as a bridge/liaison between different groups.

8) The temporal unfolding of the co-creation process: major shifts and ups and downs

A general observation about the temporal unfolding of the MCP project was that it started with a narrow focus (improving the quality of the Nicasio Native Grasslands Ranch) and gradually became more ambitious as positive scientific results appeared and the participants came to see the broader implications of the research. However, as the vision of what the MCP could do became more ambitious, tensions also developed about how to take the project forward. After the early successes, there was also less clarity about the value-added of the MCP and some sense of "drift." The early funding through Nicasio Native Grasslands Ranch really galvanized the early collaboration and members experienced a high degree of enthusiasm and excitement. But to some, the collaboration is not currently as strong or qualitatively the same. We note that this is a common pattern in grassroots innovation movements, which often cycle between fragmentation and coherence.[3] There is staff turnover in the participating organizations that can have implications for commitments to the project.

Another general observation about temporal unfolding is how investments, efforts, and achievements at one time shape the opportunities at subsequent points. For example, one interviewee observed that "…without that [Marin Climate Action Plan] chapter, we maybe don't get the Coastal Conservancy grant for a million dollars. We maybe don't get the Climate Smart Grant for $10 million." The activities that the MCP undertakes also have feedback effects on the attitudes and perspectives of the participants. For example, one interviewed observed that "I don't think we all spoke to the need to really scale up faster, larger, until we wrote that chapter together."

9) The most important governance factors (may include factors other than those in focus in this project)

A key governance factor may be the fact that there is a group of county-level organizations who have a history of working together on agricultural issues in Marin. See the discussion in the "openness of public governance" section below. It comes up over and over that there is a strong informal network of people who know each other well and have worked together over time. Note that research on environmental "adaptive governance" stresses the importance of these "shadow networks."[4]

Another key governance dimension might be the tight link between experimental science and implementation, which one interviewee described as "R&D development and deployment." However, we also note some tension inherent in this model, as expressed by the view that "now we have the science so let's act on it." The science-driven model, as described in the "lessons learned" section below, might respond that science has continuing relevance during the implementation phase and for continuing to set the strategic agenda.

In terms of scoring, important governance factors are: severity of the biosphere conditions, openness of governance paradigms to collaboration, and blended financing. The severity of biosphere problems is what triggers the initial collaboration. A coalition of county-level organizations with a history of collaboration among themselves with the county gradually formed and succeeded in turning the results of scientific experiments into an implementable governance instrument in terms of Carbon Farm Plans.

10) The generated outputs and outcomes

Scientific results: A number of important research papers have been published on the results of the MCP research project (DeLonge et al., 2013; Mayer et al., 2018; Owen, Parton and Silver, 2015; Ryals and Silver, 2013; Ryals et al., 2014, 2015, 2016; and Silver, Ryals and Eviner, 2010). A brochure developed by the Carbon Cycle Institute summarizes some of the most powerful scientific results:

Research by Marin Carbon Project scientists indicates that a single application of a half-inch layer of compost on grazed rangelands can significantly increase forage production (by 40-70%), increase soil water holding capacity (by roughly 26,000 liters per hectare), and increase soil carbon sequestration by at least 1 ton per hectare per year for 30 years, without re-application. Sequestration of just one metric ton of carbon per hectare on half the rangeland area in California would offset 42 million metric tons of CO2e, an amount equivalent to the annual greenhouse gas emissions from energy use for all commercial and residential sectors in California (Carbon Cycle Institute brochure on carbon farming).

One interviewee described another key research finding to be that "you could create carbon rich soil rapidly." Interest in the MCP scientific finding has been expressed by important state and federal institutions, including by Karen Ross, Secretary of the California Department of Food and Agriculture, Mary Nichols, the California Air Resources Board, and Adam Chambers, a climate scientist with the USDA. MCP findings also fed into the U.S. Department of Agricultures' list of 34 beneficial farming practices. Finally, Whendee Silver has been contacted by White House staff interested in exploring hhow the MCP results can feed into US federal climate planning.

Carbon Farm Planning: Creating "carbon farm planning" was one of the key MCP outputs. A carbon farm plan is a plan for how to sequester carbon and reduce greenhouse gas emissions on a single farm or ranch by changing soil management practices including application of compost on grazed rangeland. The MCP has supported the development of 20 carbon farm plans in Marin covering 14,000 acres and they are currently developing carbon farm plans for seven more farms. The sequestration target for carbon farming of the Marin CAP 2030 is 55,752 MT CO2e by 2030 leading to an estimated cumulative reduction of 256,585 MT CO2e over 20 years (https://marincarbonproject.org/what-is-carbon-farming/#what-is-carbon-farming). If implemented, this target would achieve 30% of the total estimated sequestration potential calculated based on the completed carbon farm plans (feedback from facilitator).

A carbon farm plan for an individual farm or ranch takes about 6-8 month to develop and the number of plans that can be completed depends on the amount of money that can be devoted to it. Another significant challenge is that while the plans are free to farmers, implementation is often too expensive for them, especially when implementation costs get inflated. The Marin RCD helps farmers with carbon farm plans to apply for grant money to finance their implementation. A related point is that the cost of achieving carbon sequestration varies significantly across farming practices, with some expensive but still valuable practices producing much less sequestration than less expensive practices (e.g., an expensive windbreak versus a less expensive compost application).

Other counties have imitated Marin, and a USDA grant is supporting the development of 40 carbon farm plans in the region. This program has also expanded the development of carbon farm plans to 42 Districts

in California and to Texas. The Carbon Cycle Institute (not MCP per se) has been responsible for extending carbon farm planning outside Marin. It has created "carbon farming hubs" throughout the state of California (https://www.carboncycle.org/carbon-farming-network/). However, the CCI is "based on the work of the MCP" and it is "spreading" the "Marin Model." CCI was started in 2013 by three people associated with the MCP.

There is some debate about the efficacy of carbon farm plans. While some see carbon farms plans as a critical and valuable strategy, others point out that these plans are expensive, time-consuming, inflexible, overly technical and likely to create bottlenecks as the demand for carbon farm plans is bigger that the capacity to prepare them. A more rapid and streamlined planning process may be more appropriate, as pointed out by one interviewee:

The solution is to make them easier to write. A lot of the practices are going to be the same from dairy to dairy. You're just adapting some contextual information to a suite of similar practices. Because right now, some of the plans are too expensive. The $20,000 plans, probably more than they need to be, as opposed to the $5,000 plans, you get a very similar output (the informant notes that Sonoma RCD only charges $5,000 for its carbon farm plans).

Another challenge for carbon farm plans is that farmers cherry-pick the practices they are most interested in.

In addition to the development of carbon farm plans, the MCP worked with the USDA climate science team to build a planning tool for California (funded by the Rathman Family Foundation) that contributed to and supported the concept of carbon farm planning. The tool was "an entry point tool that showed people the potential of doing climate-smart agriculture, and the impact it would have" (interview). The MCP results also fed into California's Healthy Soils Initiative, which was in part based on carbon farm planning ideas. Early MCP work also contributed to the creation of a protocol for carbon farming on grazing lands with the American Carbon Registry, Environmental Defense Fund and Terra Global Capital.

Input into the Marin County Climate Action Plan: The MCP first got involved in the Marin County Climate Action Plan (CAP) in 2014. At this point, a connection was made with the county planner, but input into the 2020 plan was limited. For the 2030 plan, however, the input has been much more significant and the carbon sequestration group, which was predominantly composed of MCP members, met for 6-8 months. The participating MCP members contributed an entire chapter on the agriculture sector for the CAP and one interviewee noted that this input "really added a lot of value to the county" and another observed that "we're probably the single most significant element in the CAP for the county, so the potential is there and there is emerging interest, it's still growing." Ultimately, carbon farming was one of seven "solutions" endorsed by the Marin County Board of Supervisors.

One Interviewee provided a nice summary of the MCP's involvement in the CAP:

Why does a county jurisdiction need a climate action plan in California? It's because of state legislation, AB 32. So, you come forward and we're already doing this work as AB 32 is getting passed, and as local

jurisdictions are starting to write their plans, we have a relationship through county government. And in 2015 we get the first Ag chapter into a climate action plan. Wasn't the best; it was just a couple of pages. And it was disappointing for us as members. We'd spent some time with the county, we'd given them copy… So that was the first real call out in 2016, by getting that little chapter in there and those climate action plans renewed, right? Every five years. Ostensibly, we were in a really good position that the county came to us with, again, a funding grant to write their climate action plan, but to help give us time to write in a better chapter, a more comprehensive chapter. The chapter that's in there now was about an eight-month effort where, as Marin Carbon project members we met monthly, kept each other up to date. We each took different parts and worked on some of the analysis.

This interview also notes that the MCP's work also "informed the Sonoma Climate Action Plan".

11) Lessons learned about the conditions for co-creating green solutions

One challenge for the MCP we observed was the tension between what individual members are doing as part of their individual missions and what the MCP is bringing to the table as a collective. Some interviewees were hazy on the value-added of the MCP over and above what individual or organizations were already doing. As one interviewee put it, "How do you separate out what the individual organizations are doing versus what it is we're doing in collaboration? I think that that's where our biggest challenges are right now." Another interviewee told us that "It's a collaborative hub. So, it's an organization of organizations with no staff which means it can oftentimes be hard to get things done as a group because everyone's first priority is managing their own organizations." The MCP has a value for "getting people together for talking" but it is not "as clear what the extra additional value added is in terms of directing you towards a particular outcome or project." However, this interviewee really liked to hear about what other partners are doing at MCP meetings and another interviewee stressed the value of the MCP's role as a collaborative hub: "MCP has just been a great crucible of learning because it connected so many organizations through a steering committee versus one organization holding everything." From the perspective of some members, there is also an advantage of the MCP operating as a network rather than an organization: an organization would have to be "fed" and this would focus the group on funding rather than on their shared goals.

<u>Group DNA</u>

Our analysis of the "DNA" of the MCP identifies three critical dimensions: science-drive action, local resource conservation partnerships, and an ecological perspective.

Science-driven action. The MCP is a "very hard science driven group" (interview). A science-driven approach was important from the start and part of the personal beliefs of the founders. The Rathman Family Foundation, which provided funding for the early research, stresses the importance of "rigorous peer-reviewed public science" and it was important to have a "science-based solution" (interviews). At one point, however, the Nicasio Native Grassland Ranch and the rangeland ecologist within the Resource Conservation District and Chief Agronomist at the McEvoy Olive Plantation decided "we're done with the science"—it was time to move to implementation (interviews). Nevertheless, as one interview noted: The Marin Carbon Project was unique for the science it produced and the partnerships with UC Berkeley. The scientific and producer partnerships alone were really, really unusual and very fruitful." But the MCP model

went beyond being “science-based.” It connected science to implementation. One interviewee observes that the Rathman family was an inspiration for this model:

he founded one of the first biotechs in the country, Amgen. And he was a scientist and he did his own R&D and then deployed it at a commercial scale. [His children] took a similar path of doing the R&D and then figuring out pathways for deployment, essentially like how you commercialize and bring the product into market.

Some concerns were expressed that MCP efforts should not get “ahead of science” for fear that overinflated claims for the value of composting could tarnish the legitimacy of the MCP’s work.

Local resource conservation partnerships. Another part of the group DNA is the “RCD” model, which is a model of local cooperation between a special district and individual farmers and ranchers. According to one interviewee, “RCD is the central implementation member” and according to another it is the RCD that is “interacting with the farmers and ranchers and identifying people who want to develop carbon farm plans.” The RCD (and the NCRS) not only have relationships with farmers and ranchers, but they also act as a crucial intermediary by linking them to external technical assistance and funding. RCD’s are the “…most amazing form of government you can possibly imagine because they're cooperative without being government” (interview). The RCDs (or their equivalent) are particularly active with carbon farm planning in California as a result of the state’s commitment to reducing carbon emissions (interview). While the Marin RCD has been crucial to carbon farm planning, the NCRS operates according to a similar outreach model and their farm planning process provided the original model for carbon farm planning.

An ecological systems perspective. A third aspect of the group DNA is a systemic, ecological perspective on agriculture. As described by an interviewee: “We have to think about how we manage land differently in its entirety. For water quality, quantity habitat, health, all of those things.” This idea is embodied in the “carbon farm plans,” which are “about mitigating emissions, but… also about restoring the soil and water and air.” The ecological perspective is also represented in ideas about ”land stewardship” and ”nature-based solutions” to sustainability problems. Although a number of people brought this perspective to the MCP, several interviews point to the rangeland ecologist within the Resource Conservation District and Chief Agronomist particular influence.

An example of how these three components of group DNA come together is well-stated by one interviewee:

“I've never seen anybody produce peer reviewed published papers, let alone multiple of them and figure out a structural format to deploy that knowledge. It was the papers, but it was also the form that they created with the RCDs and the counties and cities as actors and the land trusts that made it so interesting to me.”

This informant goes on to describe this “system” in more detail:

"Because I saw that they had this little system whereby you took the compost application, you did field trials to understand how it worked in different climates, in different areas. You worked with leading ranchers because of the peer-to-peer influence. Farmers are most influenced by other farmers. And you worked with the conservation districts, which are broadly dispersed in almost every county throughout the United States… I understood that they had built a system that was replicable in almost any county in the country."

This scaling strategy is like the "polishing gemstones" strategy described for scaling up social innovations.[5]

Scoring and analysis of governance factors

1. Perceived importance of biosphere conditions

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Although the Nicasio Native Grassland's early interest was in creating a nesting habitat for native birds on his ranch, they gradually grew much more focused on the climate crisis. The rangeland ecologist within the Resource Conservation District and Chief Agronomist was the one who brought the initial concern about the climate crisis. Although public concern about climate change has been intensifying over time, it was not particularly strong when the project first started in 2008. Nevertheless, the problems of the biosphere, such as climate change and degradation of soil and water quality, are important to most if not all members. As one interviewee put it: "I think we never came together to make the MCP; we came together to achieve the climate carbon management goals." It is worth pointing out that participants have a range of primary objectives, such as preserving or restoring agricultural land, and responding to climate change is not necessarily their overriding objective. Still, these different goals are generally seen as complementary (several interviews). In addition, the sense of "urgency" about climate change has grown over time, partly as result of the work of the group and the recognition that they had discovered an important strategy for dealing with the climate crisis (interviews).

2. Legislation, programs, and formal goals

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☒ Medium confidence	☒ Documents
☒ 0.66	☐ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The MCP has aligned itself and drawn resources from national programs and policies, but it would be difficult to infer that these policies and programs have oriented or directed the MCP. The MCP has worked with the U.S. Department of Agriculture at various times and in various ways and it currently has a USDA Climate-Smart Commodities grant. The NCRS, a USDA agency, has also supported the MCP, and some federal monies may flow into the work of the UCCE, which has supported the MCP. California legislation and programs seem to be the most influential. California's climate change bill, AB 32, was mentioned in a few interviews as orienting people's thinking about the possibilities for carbon farming. State-level agricultural grant programs have also provided important resources. The most important public program for the development of the MCP has been the Marin Resource Conservation District (RCD), a hybrid of state and county government. Its history of working on land stewardship in Marin has shaped and enabled the MCP. However, it is not so much the formal legislation, programs or goals of RCDs per se that matter, but the particular embedding of the RCD in the agricultural community of Marin. Finally, it is also clear that Marin County government has supported the MCP. The MCP has been aligned with the County's efforts to develop a Climate Action Plan and Marin County voters have approved a sales tax (Measure A) that supports sustainable agriculture. However, the influence of MCP probably flows more in the direction of the County than the other way around.

3. Relative openness of public governance paradigms

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Our interviews suggest that **county-level** public institutions working with Marin agriculture had a strong tradition of collaborating and that this collaboration has contributed in important ways to the development of the MCP. At the same, a number of interviews suggest that, although Marin County's board is generally quite supportive of environmental goals, the County can be highly bureaucratic and the quality of collaboration varies across sectors. County planners, for instance, seemed very open to public-private partnerships, which they see as essential for leveraging the resources and skills of the County (interview). But the agricultural sector may be something of a positive outlier in terms of how Marin County operates. One interviewee explained the logic of this exceptionalism to us:

> Why it worked in Marin is because there's the Eastern Marin, which is along the corridor, which is where development is. And then there's West Marin, which is agriculture and the National Park Service. And the county of Marin seeded control around natural resource management issues and local issues to the Marin RCD... The county was not interfering. It really said: "you guys make decisions, work with the ag community", which was great… and you will not find that in most other places. That's very unique."

At the **state level**, the message is also somewhat mixed. As one interviewee observed, "our state government doesn't recognize the importance of local and regional conservation partnerships and collaboration. They're stuck in their agency hierarchies and models." However, the RCD is itself a state-county hybrid institution built around a model of local community partnerships.

A similar point can be made at the **federal level**. One interviewee discussed the tensions between top-down versus bottom-up change management and pointed out the ineffectiveness of the U.S. Department of Agriculture's top-down approach. However, the NCRS, a USDA agency, also adopts a bottom-up local partnership approach to some degree.

The appropriate conclusion to draw is that federal, state or county government have limited traditions of public governance openness, but the Marin agricultural sector does have such a tradition rooted in a model of building direct partnerships with farmers. The collaboration between the RCD, MALT, NCRS, and UCCE is based on their shared model of working closely with individual farmers and ranchers. Marin's historical alliance between agricultural and environmental protection to preserve agricultural lands also supports this tradition of collaboration (see the "Background, history and context" section).

4. Formalized institutional channels for citizen participation and community mobilization

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☒ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

In the US, there are many legal, institutional, and organizational structures supporting citizen participation and community mobilization. The constitution grants citizens the legal right to vote, participate in public debate, and form associations, and the multilevel structure associated with a federal political system, the electoral system, and an extensive use of referenda provides access for citizens to influence local political processes. Although the use of these rights and opportunities varies between localities and communities, the general picture is that there is a strong tradition for citizen participation and a vibrant civil society. This is particularly true in Northern California where there is a century long tradition for citizen participation and community self-organizing.

There are also some specific institutional arrangements in addition to the ballot box that are in place at the regional and municipal level that allow citizens to take part in governing certain services or to comment on concrete policies. User participation on school boards is significant and there are also formal procedures for citizen participation, such as hearings that grant citizens a say on matters such as planning and infrastructure projects. In California, citizens also have the right to make propositions for new laws, the fate of which is determined through referendum. Finally, the right to form a marketing commission in agriculture is an important, although very special, channel for citizen participation that allows farmers to organize in a shared effort to promote their commodity.

Farmers and ranchers have been institutionally represented on the steering committee through MALT and the RCD, which have strong ties to them. MALT has a requirement that 50% of its board members must be agriculturalists (interview). Several interviews discuss the importance of talking directly with farmers and ranchers and of taking their perspectives seriously. The agricultural extension service, a federal program organized through land-grant universities (in this case, the University of California, Berkeley) has a long history of direct outreach and cooperation with farmers.

At the County level, however, at least one interview said that Marin does not have a strong tradition of stimulating citizen participation.

5. Mechanism for ensuring top-down government and bottom-up social accountability

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☒ 0.33	☒ Medium confidence	☐ Documents
☐ 0.66	☐ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Given that the MCP serves as more of a collaborative hub than an organization, financial accountability controls operate at the level of individual member organizations, both public and private. Additional accountability mechanisms have not been developed at the MCP level, unless perhaps you were to point to an informal "peer accountability" that holds between members. A culture of accountability might also be argued to exist at the MCP via the concept of "monitoring, reporting, and verification" (MRV), which guides much of its work on science and carbon farm planning (interview). There is almost no sense among MCP members that it is "socially accountable" to an external public audience. The MCP has been criticized for "greenwashing," but these criticisms are dismissed as ill-informed (interview).

6. Strategic agenda-setting by means of translation

QCA score:	Scoring confidence:	Data sources:
☒ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Although the informants we interviewed are aware of the UN Sustainable Development Goals, it is clear that the SDGs do not orient or direct the MCP, although the goals of the MCP are compatible with several of the green SDGs. Some informants told us that the anti-UN and anti-climate policies of the Trump administration have served to limit the role of the SDGs in the US.

Nevertheless, it is very clear from many interviews that the members of the MCP, and the MCP as a collective, regard it as important to adapt general goals to the specific conditions of farming. The concept of carbon farm planning embodies the idea that general goals must be adapted to the conditions of each farm. Thus, there is an attempt to translate broad goals, but these general goals are not used to motivate people to join the co-creation project.

7. Construction of narratives about successful multi-actor collaboration

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☒ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

As noted, a historic alliance of agriculture and environmental protection developed in Marin to preserve farmland from urban encroachment. While we heard only a few references to this broader alliance as a narrative of collaboration, its legacy shapes the understanding of key MCP actors. MALT and its emphasis on "land stewardship" particularly embody this historic alliance. MALT plays an important role via storytelling about Marin farmers and ranchers and they have a marketing capability to telegraph it (interviews). The land stewardship theme also aligns well with the theme of "nature-based solutions," which was expressed in several interviews. One interviewee observed that "[w]e're working on what I think would be called nature-based solutions on working lands." Another narrative theme is the "carbon cycle," as highlighted by the creation of the "Carbon Cycle Institute" to extend the work of the MCP. As one interviewee observed, "[w]e can all make compost. We can all cycle carbon, we all have that, it's very empowering. And it's very simple and it's very accessible."

To summarize, there may not be a highly articulated and convergent narrative about successful collaboration that motivates the project and around which everyone is organized, but there are clear narrative touchstones referring to sustainability (i.e., land stewardship, nature-based solutions, and the carbon cycle) that members share and that serves as a resource in collaboration and communication.

8. Building or harnessing institutional platforms and arenas

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☒ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Whether there is a "platform" that supports the MCP is a somewhat tricky question. There is clearly no digital platform supporting collaboration (interview). One could say, however, that CCI, MALT, NCRS, RCD and UCCE are platform-like organizations that have provided clear support for the MCP. As noted, these organizations exist to provide support to farmers and ranchers and are designed to help bring knowledge, resources and best practices to the agricultural community. At the same time, they are core members of MCP, so it is a little odd to talk about them as external platforms. Yet it is very clear that the RCD, in particular, serves as a critical framework upon which carbon farm planning could develop. The Carbon Cycle Institute could be said to operate as a platform for taking MCP beyond Marin.

9. Provision of access to blended financing

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

It is quite clear that MCP financing is "blended" in the sense of drawing on funding from various sources, including different public sources (Federal, state, county) and several foundation sources. One informant provides a nice analysis of the importance of "blended capital":

> Let's say a farmer, let's say a rancher in Marin wants to do a carbon farm plan. They're going to need the RCD. The RCD is going to need funding to deploy staff to do the plan with them. Okay. One source of funding. That farmer is going to need funding to deploy the plan once it's done. Then that's often multiple types of funding because NRCS is a cost share and oftentimes 30% is not going to get a farmer to do it. Okay, so you need some additional money there and that money can be state money or it could be private money. It could be money from a bank, but if you're not farming in a commodity system, it's very hard to get financing for debt outside of a commodity system. You have to look at private and then also public sources of funding, hence the Healthy Soils legislation to provide more funding.

The MCPs original start-up money came from two foundations, the Rathman Family Foundation and the Marin Community Foundation, which funded the early research. As the MCP moved toward the development and implementation of carbon farm plans, it has drawn on federal, state and local public funding. MALT and CCI also bring in philanthropic money.

While the MCP clearly works with multiple public and private sources of funding, it is important to point out that this funding is rarely "pooled." Instead, different sources of funding are used serially, by different organizations, to address different aspects of the larger project. As one informant noted, it is tricky to "blend" public and private money because of the accountability concerns about public monies. Conversely, private organizations in Marin see the County as "tax-funded" and can be skeptical about contributing private monies to public projects.

10. The capacity to leverage support from authorities to enable local collaboration

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☒ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The NRCS and Marin RCD do not engage in policy development or advocacy. However, other members of the Marin Carbon Project including UCEE, MALT and CCI, work to advance programs and policies at the local, regional, state and federal levels that support farmers and ranchers. Federal, state and county levels of government have provided support for scientific research and carbon farm planning. There are also examples of members of the MCP reaching out to work with the state and federal government on various issues and one interviewee pointed out that MCP members have the capacity and credibility to reach out to higher levels of government. In addition, the contribution of the MCP to the County CAP has helped to generate demand for additional carbon farm plans. Finally, it is worth mentioning that the founder of the MCP, hired a lobbyist that was highly successful in improving the conditions for the spread of the new soil management solutions developed by the MCP. However, this was after he left the MCP. Currently, the MCP seems reluctant to go in this direct and play an increasing role as lobbyists.

Nevertheless, with respect to the spirit of this question, the informants do not suggest that leveraging higher levels of government was a critical factor in shaping the capacity of the MCP to co-create new climate solutions.

11. Inclusion and empowerment of relevant and affected actors

QCA score:	Scoring confidence:	Data sources:
☐ 0	☒ Low confidence	☒ Interviews
☒ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The MCP did not bring a lot of ranchers into the program early on because they mostly “learn from their peers” and they “want to talk about forage, not carbon” (interview). Instead, the project focused on “the outliers in terms of being those successful operations that every other rancher looked up to” and sought to work with “successful people who were actually spokespersons to their community.” So, from this perspective, the MCP has not really been “inclusive” or tried to “empower” actors with fewer skills or resources.

There is some discussion now on the steering committee about the need to be more “inclusive,” though this general means strategically incorporating a few select partners. For example, as one informant reported: “I think that we are experimenting now; to scale up and accomplish our goals, we need more than just those on the steering committee… Our steering committee might become the core group for a

broader inclusive effort to scale up." At the same, steering committee members are cautious about expanding too much.

Finally, with the Carbon Farm Plans there have been concerns about how poorer farmer can get access and be part of the program.

12. Clarification of interdependence vis-à-vis common problem and joint vision

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

Asked whether the members are interdependent, one interviewee responded that "Yes, definitely, and they know they work together very well." Another interviewee said: "I do think Marin and our organizations have weathered lots of things together and have a high level of interdependence." Others observed the dependence of the MCP partners on the "science" or pointed out that "[e]verybody who participated had a 'stake' in the outcome." However, one informant wondered how much it is the people versus the organizations that matter for this interdependence. A general indicator of interdependence is that we heard in several interviews that members are motivated to participate because they want to learn something from other members.

A clear example of interdependence is suggested by the way that the Nicasio Native and the rangeland ecologist within the Resource Conservation District and Chief Agronomist reached out to Whendee Silver to provide scientific input, and then the way that Silver relied on MALT and RCD to help provide access to farms. A more general way to think about interdependence in this situation is that farmers and ranchers own and control their land but need funds, resources and expertise to manage those lands more sustainability. By contrast, public and private groups interested in fostering greater sustainability may have these funds, resources and expertise, but they need access to private property in order to successfully utilize them. Interviews also suggest a kind of "pooled interdependence" on the MCP "brand." A strong MCP "brand" can allow individual members to both build on and contribute back to the MCP (interviews).

13. Trust-building and conflict mediation

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☒ 0.66	☒ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

As one interviewee noted: "Trust is critical. We could not have done all of this without trust." Another said: "Great set of partners. Lots of trust" and mention how "we take turns leading… That's because there's a lot of trust and a lot of understanding of the respective goals and missions of each organization." Transparency has been one key strategy for building and maintaining trust (interview). But another interview noted that the MCP has not purposefully sought to cultivate trust, but rather draws on trust established outside of the MCP (though this interviewee later notes that managing tensions requires that you "work at it").

While the MCP has worked through conflicts over time, it does not have formal conflict resolution mechanisms, although there were clearly some informal conflict mediation exercised by the facilitator at the steering committee meeting that we observed. Still, one informant observed that the MCP could probably have done a better job of conflict resolution and we heard a few expressions of distrust of certain people or organizations.

14. Use of experimental tools for innovation

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☒ Documents
☐ 0.66	☒ High confidence	☐ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

The MCP's science-driven research on "test farms" was clearly an important form of experimentation. In the first years of the MCP, the experimental scientific approach to establishing 'proof of concept' was the most central activity of the MCP.

15. Ongoing critical self-reflection and learning (i.e., process and/or developmental evaluation):

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☒ Medium confidence	☐ Documents
☒ 0.66	☐ High confidence	☒ Observations
☐ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

There have not been scheduled systematic evaluations, but there have been retreats and strategic planning exercises throughout where members deliberate about goals and achievements and adjust their course. The initial explorative workshops organized by the Nicasio Native Grassland Ranch and the use of an experimental method also generated spaces for self-reflection and learning. Thus, MCP members have been self-reflective and engaged in informal evaluation but have not engaged in any kind of formal evaluation. As such, there have not been external reviews that might have sparked learning.

16. Exercise of facilitative leadership:

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Interviews
☐ 0.33	☐ Medium confidence	☐ Documents
☐ 0.66	☒ High confidence	☒ Observations
☒ 1		

Please elaborate on the reasoning behind your scoring for this governance factor:

In the early years of the MCP played an important role in facilitating the work of the group, creating "a safe space for friendly discussions" (interview). He even participated in a San Francisco program called "Essential Facilitation" to improve his facilitation skills. He also hired a professional facilitator to help with the group and the meetings were often held at his ranch. The facilitator was an organizational development specialist who helped develop the structure, mission and goals of the MCP (interview). One interviewee reported that the group facilitations had been "painful" but had moved things forward.

The MCP evolved over time into a collective leadership model where the steering group makes decisions by consensus and this has worked pretty well. There have been some tensions where members made key decisions outside the group, but these issues were resolved. The steering group has been kept intentionally small to increase the effectiveness of meetings. In this rather long middle period facilitative leadership was weak.

The current MCP Coordinator has been doing a lot of facilitation work to keep the agenda moving forward (interviews and observations). One reason for hiring a coordinator has been to maintain progress between meetings: "We're all way too busy. That's the bottom line. Even though you have a good successful meeting, the in-between meeting time is when things fall off and don't get the follow through" (interview). The Coordinator is "making a big difference" (interview).

Outcome variable: Successfully co-created green transitions

The outcome variable 'co-created green transitions' will be scored in two parts. First, 'co-creation' will be scored based on an assessment of whether the participants in the initiative, project or process engaged in collaborative problem-solving that fostered creative ideas and innovative solutions (data will consist of survey data combined with interviews and documents). Next, 'green transitions' will be scored based on an assessment of whether the initiative, project or process has fulfilled or is expected to fulfill its green goals, ambitions and aspirations (data will consist of survey data combined with interviews and internal and/or external evaluation reports, including scientific publications).

The scoring of this variable is done in two parts:

1. *Is the developed solution based on collaborative problem-solving spurring creativity and innovative solutions?*
2. *Does the developed solution engender a green transition?*

This scoring should be conducted based on both the survey and complementary green outcome evaluations. Please consult Sections 4.4 and 6.10 in the Research Protocol for more details.

1. Is the developed solution co-created?

QCA score:	Scoring confidence:	Data sources:
☐ 0	☐ Low confidence	☒ Survey
☐ 0.33	☐ Medium confidence	☒ Interviews
☐ 0.66	☒ High confidence	☒ Documents
☒ 1		☒ Observations

Note: Unfortunately, we coded the survey using a 5-point instead of a 7-point Likert Scale; the scores used to calculate the mean were: "strongly disagree" = -2; "slightly disagree" = -1; "neither agree nor disagree" = 0; "slightly agree" = 1; "strongly agree" = 2.

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring.

The MCP clearly brings public and private stakeholders together in co-creating outcomes. Ranchers and farmers have been involved as a founding member as test farmers, and indirectly through their representation in RCD, UCCE, and MALT. There is little to no direct engagement of ranchers as individuals on the Steering Committee, but there is considerable interaction among the steering committee members and individual ranchers. The MCP is also clearly viewed as a vehicle for green transition, and it has definitely been collaborative, creative and innovative.

If possible, please insert your survey responses in the table below (in % for each response), including the mean/average % for each survey item.

	Strong. dis.	Dis.	Slight. dis.	Neither agr/dis	Slight. agree	Agree	Strong. agree	Mean
1. Problem-solving mobilized different experiences, and/or ideas and/or forms of knowledge to develop new perspectives	8.33%	NA	0.00%	8.33%	16.67%	NA	66.67%	1.33 (**NB**: these are all out of 2, not 3)
2. Through the collaborative problem-solving process, different experiences and/or ideas and/or forms of knowledge have been mobilized to search for unconventional solutions	8.33%	NA	8.33%	0.00%	25.00%	NA	58.33%	1.17
3. The collaborative problem-solving process mobilized different experiences, and/or ideas and/or forms of knowledge to search for solutions that go beyond standard/text-book solutions	8.33%	NA	0.00%	8.33%	25.00%	NA	58.33%	1.25
4. The co-created solution breaks with established practices	0.00%	NA	8.33%	16.67%	16.67%	NA	58.33%	1.25

5. The co-created solution disrupts conventional wisdom	0.00%	NA	0.00%	8.33%	33.33%	NA	58.33%	1.50
6. The co-created solution offers new ideas to address the green transition problem	8.33%	NA	0.00%	0.00%	33.33%	NA	58.33%	1.42
7. I'm supportive of the co-created solution	8.33%	NA	0.00%	0.00%	25.00%	NA	66.67%	1.50
8. I'm content with the overall collaborative process of the project	0.00%	NA	25.00%	8.33%	25.00%	NA	41.67%	0.83
9. I feel the multi-actor collaboration process was a prerequisite for the success of the project	0.00%	NA	0.00%	16.67%	16.67%	NA	66.67%	1.50
10. I'm satisfied by the results of the co-creation effort in terms of expected impact on the welfare of the community	0.00%	NA	16.67%	16.67%	33.33%	NA	25.00%*	0.73
11. The collaborative interaction in the project has led to an innovative solution	0.00%	NA	0.00%	0	41.67%	NA	58.33%	1.58
12. The actors involved in the project are engaged in collaborative interaction that stimulated creative problem-solving	0.00%	NA	0.00%	0.00%	25.00%	NA	66.67%*	1.73
13. The co-created solution meets the proposed goals of the project	0.00%	NA	16.67%	8.33%	33.33%	NA	33.33%*	0.91
14. The co-created solution will be durable and robust in the long run	0.00%	NA	0.00%	16.67%	33.33%	NA	41.67%*	1.27
15. The co-created solution is expected to significantly improve sustainability for the whole community	0.00%	NA	0.00%	8.33%	33.33%	NA	58.33%	1.50

**One person answered "Don't know," which is 8.33%*

2. Does the developed solution engender a green transition[1]?

QCA score:

☐ 0

☐ 0.33

☐ 0.66

☒ 1

Scoring confidence:

☐ Low confidence

☐ Medium confidence

☒ High confidence

Data sources:

☒ Survey

☒ Interviews

☒ Documents

☒ Observations

[1] By "green transitions", we mean objectives and aspirations that correspond to at least one of the Green SDGs (SDG 6, 7, 11, 12, 13, 14, 15). The project does not have to refer explicitly to the green SDGs, but the project's green objectives

Please elaborate on the reasoning behind your scoring for this part of the governance factor, including the data sources used for the scoring:

The MCP has led to fundamental scientific insights about the value of composting and soil management for sequestering carbon on rangelands. The MCP has also developed a tangible process of "carbon farm planning" to implement these insights and has successfully established carbon farm plans in Marin. In addition, the research insights of the MCP have influenced Marin County (Marin Carbon Action Plan) and California programs (e.g., the Healthy Soils Program). The MCP "model" has been extended beyond Marin by the Carbon Cycle Institute, leading to the expected sequestration of a significant amount of CO_2.

If possible, please insert your survey responses in the table below (in % for each response).

1. The project:	Yes	No	Don't know
…did not produce any green transition solution	80.00%(8)	20.00%(2)	
…is expected to produce/has produced a green transition solution aiming to avoid a worsening in the status quo	75.00%(6)	25.00%(2)	
…is expected to produce/has produced a green transition solution aiming to maintain the status quo	33.33%(3)	66.67%(6)	
…is expected to produce/has produced a green transition solution aiming to improve the status quo	100.00%(12)	0.00%(0)	

Please list all the informants you have interviewed for the case study (list project role + interview date):

Principal Planner, Marin Community Development Agency and Sustainability Team Supervisor, interviewed January 26, 2023.

Founder and Director of Fibershed, interviewed January 6, 2023

Sustainability Manager, Strauss Dairy, interviewed December 4, 2022

MCP Founder, Director of Rangeland and Agroecosystem Management of the Carbon Cycle Institute, and MCP Steering Committee Member, interviewed December 16, 2022

Managing Director, Carbon Cycle Institute, interviewed December 16, 2022

Director of University of California Cooperative Extension for Marin County, and MCP Steering Committee Member, interviewed December 22, 2022

The Breakthrough Institute and Managing Partner, Terra Regenerative Capital, interviewed April 10, 2023.

Marin Agricultural Commissioner, interviewed December 16, 2022

Former Senior Sustainability Analyst, County of Marin, interviewed January 26, 2023

Director, Marin Resource Conservation District, and MCP Steering Committee Member, interviewed December 2023

Lead MCP Scientist and Professor of Ecosystem Ecology and Biogeochemistry, University of California, Berkeley, and MCP Steering Committee Member, interviewed October 28 and December 20, 2022

CEO, Strauss Dairy, and MCP test farmer, interviewed December 4, 2022

Executive Director, Marin Agricultural Land Trust, and MCP Steering Committee Member, interviewed April 3, 2023

MCP Founder and Rancher, Nicasio Native Grass Ranch, interviewed December 18 and 19, 2022

MCP Coordinator, interviewed December 20, 2022

Please list all the observations you have made (type of meeting/workshop/etc. + observation date):

California Climate & Agricultural Network Conference, UC Davis, November 14, 2022

MCP Steering Committee Meeting, June 2, 2023

Please list all the documents you have analyzed (document name + source + year):

General Documents about MCP

About MCP – Marin Carbon Project

Marin Carbon Project celebrates its 10-year anniversary – Marin Carbon Project

MCP_Poster_Final.pdf: Marin Carbon Project: Land Management can Sequester Carbon in Soils

MCP Timeline.pdf: "Context and Overview of Carbon Farm Planning Process,"

Marin Carbon Project 2021 Strategy + Charter. 2021_MCP Charter.docx.pdf:

Policy and Guidance Documents

Carbon Cycle Institute brochure on carbon farming: Carbon Farming: Increasing Fertility & Water Holding Capacity. Providing Solutions for Climate Change.

CBA 2017 Symposium, Scaling the Findings of the Marin Carbon Project

Marin Carbon Project, Rahr Grant Deliverable, Marin Carbon Project's statement on Carbon Markets, March 24, 2020

Marin County Unincorporated Area Climate Action Plan 2030 (December 2020)

Scientific Results

Marin Carbon Project website, "Science" Page, Science – Marin Carbon Project

DeLonge, M. S., Ryals, R., & Silver, W. L. (2013). A lifecycle model to evaluate carbon sequestration potential and greenhouse gas dynamics of managed grasslands. *Ecosystems*, *16*, 962-979.

Mayer, A., Hausfather, Z., Jones, A. D., & Silver, W. L. (2018). The potential of agricultural land management to contribute to lower global surface temperatures. *Science advances*, *4*(8), eaaq0932.

Owen, J. J., Parton, W. J., & Silver, W. L. (2015). Long-term impacts of manure amendments on carbon and greenhouse gas dynamics of rangelands. *Global change biology*, 21(12), 4533-4547.

Ryals, R., Eviner, V. T., Stein, C., Suding, K. N., & Silver, W. L. (2016). Grassland compost amendments increase plant production without changing plant communities. *Ecosphere*, *7*(3), e01270.

Ryals, R., Hartman, M. D., Parton, W. J., DeLonge, M. S., & Silver, W. L. (2015). Long-term climate change mitigation potential with organic matter management on grasslands. *Ecological applications*, *25*(2), 531-545.

Ryals, R., Kaiser, M., Torn, M. S., Berhe, A. A., & Silver, W. L. (2014). Impacts of organic matter amendments on carbon and nitrogen dynamics in grassland soils. *Soil Biology and Biochemistry*, *68*, 52-61.

Ryals, R., & Silver, W. L. (2013). Effects of organic matter amendments on net primary productivity and greenhouse gas emissions in annual grasslands. *Ecological Applications*, *23*(1), 46-59.

Silver, W. L., Ryals, R., & Eviner, V. (2010). Soil carbon pools in California's annual grassland ecosystems. *Rangeland Ecology & Management*, *63*(1), 128-136.

Please note the response rate for the survey/measurement of outcome variable:

12/24 = 50%