UNIVERSIDAD NACIONAL AUTÓNOMA DE MÉXICO
POSGRADO EN CIENCIAS DE LA SOSTENIBILIDAD
INSTITUTO DE ECOLOGÍA, UNAM

"PROMOVIENDO VÍAS HACIA LA SOSTENIBILIDAD: EL LABORATORIO DE TRANSFORMACIÓN EN EL SISTEMA SOCIO-ECOLÓGICO DE XOCHIMILCO"

TESIS
QUE PARA OPTAR POR EL GRADO DE
DOCTORA EN CIENCIAS DE LA SOSTENIBILIDAD

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CIUDAD UNIVERSITARIA, CIUDAD DE MÉXICO, SEPTIEMBRE 2022

Coordinación de Estudios de Posgrado
Ciencias de la Sostenibilidad
Oficio: CGEP/PCS/115/22
Asunto: Asignación de Jurado

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Presente

Me permito informar a usted, que el Comité Académico del Programa de Posgrado en Ciencias de la Sostenibilidad, en su sesión 78 del 15 de marzo del presente año, aprobó el jurado para la presentación del examen para obtener el grado de **DOCTORA EN CIENCIAS DE LA SOSTENIBILIDAD**, de la alumna **Charli Joseph Lakshmi Elisa** con número de cuenta **98770210** con la tesis titulada "Promoviendo vías hacia la sostenibilidad: El laboratorio de transformación en el sistema socio-ecológico de Xochimilco", bajo la dirección de la Dra. Hallie Catherine Eakin Shepard y Dra. Marisa Mazari Hiriart.

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Sin más por el momento me permito enviarle un cordial saludo.

ATENTAMENTE,

"POR MI RAZA HABLARA EL ESPIRITU"
Cd. Universitaria, Cd. Mx., 14 de septiembre de 2022.

Dr. Alonso Aguilar Ibarra
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Contenido

«El ajolote es nuestro emblema. Encarna el temor de ser nadie y replegarse a la noche perpetua en que los dioses se pudren bajo el lodo y su silencio es oro…».
José Emilio Pacheco

Agradecimientos

'final' que en realidad no cerró, sino que sigue abierto … Gracias también a Juliana Merçon, con esa voz suave, y a la vez poderosa, que inspira tanto y que contagia esperanza y sororidad para co-crear experiencias más encarnadas, relacionales, y significativas. Gracias a Josie Chambers por invitarme a de-construir finamente el proceso y a expresar los aprendizajes desde otro lente. Gracias a Edwin Hes, Anne van Dam, Ingrid Gevers, María Rusca, Assiyeh Tabatabai, y Mariana Ríos, porque su apoyo emocional desde el otro lado de un océano siempre se sintió cerca, y lo que he aprendido con ustedes también se manifiesta de alguna manera en este producto.

Agradezco también a las y los colegas y compañeros con los que coincidí en el LANCIS-IE, y con los que aprendí mucho, mientras compartimos pláticas, risas y frustraciones que me ayudaron a sortear retos y seguir en este proceso a veces arduo: Amy Lerner, Rodrigo García Herrera, Abril Cid, Shiara González, Beth Tellman, Chrissie Bausch, Fidel Serrano, Emilio Rodríguez, Bertha Hernández, y Paola M. García. Y muchas gracias Karina Boege, por tu acompañamiento tan empático y cercano en la 'última' parte del proceso, fue muy importante y especial para mí.

Todas estas personas hicieron que este proyecto haya sido el más lindo y enriquecedor que he vivido hasta ahora, y en el que pude experimentar lo que implica hacer investigación acción participativa. Este proceso marca un parteaguas en mi vida…

Finalmente, aprecio y agradezco mucho la retroalimentación y comentarios de mis revisores externos: Ulli Vilsmaier, Karen O'Brien, Flurina Schneider, y Rafael Calderón, quienes me ayudaron mucho a mejorar el documento. Agradezco al Posgrado en Ciencias de la Sostenibilidad, Universidad Nacional Autónoma de México, en particular a Alonso Aguilar y a Ma. José Solares.

Gracias mamá, papá, y hermano, por su apoyo cariñoso e incondicional. Esta tesis va dedicada a ustedes.

Y dedico también este trabajo a las y los participantes del T-Lab Xochi, y otras a personas en resistencia, con apertura al cuestionamiento, y voluntad de luchar por condiciones más justas y sostenibles …

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              *•~^.,

«No hay palabra verdadera que no sea unión inquebrantable entre acción y reflexión».
Paulo Freire

«Al fin y al cabo, somos lo que hacemos para cambiar lo que somos».
Eduardo Galeano

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Resumen

Los experimentos para crear espacios de transformación socio-ecológica se han ido multiplicando. Estos experimentos pretenden trascender los espacios tradicionales de deliberación racional, planeación y toma de decisiones participativa. Los "Laboratorios de Transformación" (*T-Labs* por sus siglas en inglés) se conciben como espacios participativos en los que se activa una nueva agencia humana en relación con un reto estancado de sostenibilidad para generar transformaciones intencionadas, de abajo hacia arriba. La agencia colectiva, entendida como la capacidad de un grupo de individuos para movilizarse en función a una motivación propia y objetivos compartidos, es crucial para la transformación socio-ecológica. Sin embargo, en situaciones de estancamiento en las que los individuos de un sistema socio-ecológico tienden a resistirse a la transformación debido a los intereses invertidos en el *statu quo*, el surgimiento de la agencia colectiva se enfrenta a numerosas barreras. Dado que todavía no hay suficiente evidencia metodológica y empírica sobre cómo fomentar la emergencia de la agencia colectiva, esta investigación se preguntó cómo podemos diseñar y poner en práctica procesos que ayuden a abordar dichas barreras. La investigación postula que tales espacios y metodologías pueden facilitar procesos reflexivos, lo que resulta en la reformulación de las percepciones de las situaciones socio-ecológicas, y por lo tanto la co-creación de una base para la agencia colectiva. Para ello, se diseñó un T-Lab con métodos destinados a ayudar a los participantes a: (1) cuestionar las narrativas dominantes sobre una situación; (2) crear capacidades para replantear la situación; y (3) enactuar nuevas narrativas que apoyen la agencia transformadora del grupo. Se aplicó un conjunto de herramientas y metodologías de investigación participativa para obtener narrativas y fomentar la participación personal en la transformación de la urbanización en curso de un humedal histórico de importancia cultural y ecológica en la Ciudad de México. Al convocar a un grupo diverso de actores sociales - desde chinamperos, residentes de asentamientos irregulares, organizaciones gubernamentales y no gubernamentales, hasta académicos- este T-Lab demostró la eficacia de experimentar herramientas de reencuadre reflexivo para transformar tanto las situaciones percibidas, como la propia agencia de los participantes (es decir, los significados y valores de su rol, capacidades e intereses) en relación con la situación. Los resultados confirman el papel del reencuadre en la construcción de la agencia colectiva para las transformaciones. A lo largo del proceso, los participantes deconstruyeron sus propias narrativas, construyeron nuevas y las pusieron en práctica. Al permitir a los participantes reformular sus conexiones con el sistema, con otros en el sistema y con ellos mismos, la investigación ilustró cómo un sistema puede empezar a transformarse desde dentro hacia fuera. Esta investigación demuestra que la creación de un vínculo fuerte entre los participantes es clave, pero requiere herramientas de reencuadre que se utilizan con poca frecuencia en la investigación participativa impulsada por la academia; en particular, herramientas para la reflexividad, al tiempo que se crean espacios lo suficientemente seguros en los que los participantes pueden realmente abrirse. La reflexividad y la apertura son condiciones que permiten transformaciones profundas de los significados, fomentan nuevas colaboraciones y promueven la agencia hacia trayectorias novedosas. Estos procesos transdisciplinarios iniciados mediante la articulación de estas herramientas de reencuadre pueden ser útiles para avanzar en iniciativas que busquen crear condiciones para transformaciones endógenas.

Palabras clave: Agencia colectiva, reencuadre, narrativas, transformaciones, espacio transformador, sostenibilidad, sistemas socio-ecológicos, Xochimilco

Abstract

Experiments to create spaces for social-ecological transformation are multiplying. These experiments aim at transcending traditional spaces for rational deliberation, planning, and participatory decision-making. "Transformation laboratories" (T-Labs) are conceived as participatory spaces where new agency is activated in relation to a stagnant sustainability challenge to generate intentional bottom-up transformations. Collective agency, the capacity of a group of individuals to mobilize in the pursuit of self-motivation and shared goals, is crucial for social-ecological transformation. Nevertheless, in stagnant situations, where individuals in a social-ecological system tend to resist transformation due to invested interests in the *status quo*, the emergence of collective agency faces numerous barriers. Since there is still insufficient methodological and empirical evidence on how to foster the emergence of collective agency, this research asks how we can design and implement space-processes that help to address such barriers. The research posits that such spaces and methodologies can facilitate reflexive processes, resulting in reframing perceptions of social-ecological situations, and thus co-creating a basis for collective agency. A T-Lab was thus designed with methods that aimed to aid participants in: (1) questioning dominant narratives about a situation, (2) building capacities to reframe the situation, and (3) enacting new compelling narratives that support the group's transformative agency. A set of participatory research tools and methodologies was applied to elicit narratives and foster personal involvement in transforming the ongoing urbanization of a culturally and ecologically significant historical wetland in Mexico City. Through convening a diverse group of social actors –from local farmers, residents in irregular settlements, governmental and non-governmental organizations, to academics– this T-Lab showed the effectiveness of experiencing reflexive reframing tools to transform both perceived situations, and the participants' own agency (i.e., the meanings and values of their role, capacities, and interests) in relation to the situation. The results confirm the role of reframing in building collective agency for transformations. Throughout the process, participants deconstructed their own narratives, constructed new ones, and enacted them. Through enabling participants to reformulate their connections to the system, to others in the system, and to themselves, the research illustrated how a system might begin to be transformed from the inside out. This research shows that building a strong bond amongst participants is key but requires reframing tools that are infrequently used in academically-driven participatory research; in particular, tools for reflexivity while creating safe-enough spaces where participants can be truly open. Reflexivity and openness are conditions for allowing deep transformations of meanings, fostering new collaborations and promoting agency towards novel pathways forward. Such transdisciplinary processes initiated by articulating these reframing tools may be useful for advancing initiatives that seek to create conditions for endogenous transformations.

Key words: Collective agency, reframing, narratives, transformations, transformative space, sustainability, social-ecological systems, Xochimilco

I. Introducción

I.I. Antecedentes teóricos y conceptuales

El estudio de los cambios globales y las trayectorias hacia la sostenibilidad[1] implica el análisis de profundos cambios sociales a diferentes escalas. Estos cambios pueden manifestarse como cambios radicales, direccionales, o modificaciones incrementales en los aspectos regulatorios, técnicos y culturales (O'Brien 2012). Dichos cambios pueden o no planearse, pero siempre son el resultado de procesos complejos y multi-escalares que involucran a diversos actores sociales y ocurren a diferentes escalas espaciales y ritmos temporales (Pelling et al. 2015). Una mejor comprensión de cómo ocurren los cambios sociales duraderos y cómo se pueden promover es esencial para contribuir a enfrentar los apremiantes desafíos de sostenibilidad en el planeta.

Las transformaciones, definidas como los cambios de tipo más profundo, implican modificaciones fundamentales de los sistemas socio-ecológicos (SSE) al desafiar el *status quo* y crear nuevas respuestas de política pública, nuevas prácticas, y nuevas formas de relacionarse con otros y con el entorno (O'Brien 2012; Olsson et al. 2014; Pelling et al. 2015). Las transformaciones implican cambios esenciales en la estructura, la función, los significados, y las relaciones que conducen a nuevas formas de interacción y resultados (Patterson et al. 2015), y se requieren para fomentar SSE más sostenibles cuando éstos exhiben condiciones indeseables o insostenibles (Redman 2014). Por lo tanto, las transformaciones hacia la sostenibilidad implican cambios profundos que necesariamente alteran las interacciones y retroalimentaciones constitutivas entre seres humanos y el entorno.

O'Brien y Sygna (2013), por ejemplo, sostienen que las transformaciones deben concebirse como procesos que tienen lugar en tres esferas: la personal, la práctica y la política. Dentro de la esfera personal, la reflexividad, la confrontación de las visiones del mundo propias y colectivas y la explicitación de los valores, forman parte de un proceso necesario de transformación personal. La esfera práctica comprende los objetivos de las personas y las estrategias y acciones que emplean para alcanzarlos. La esfera política incluye las estructuras, instituciones y procesos más allá del individuo que influyen en la dinámica del sistema. Como señalan O'Brien y Sygna (2013), aunque estas esferas son interdependientes, las interacciones entre ellas rara vez se exploran lo suficiente en los esfuerzos de transformación.

Desde otra perspectiva, Scoones y colegas (2020) han sugerido tres enfoques diferentes para las transformaciones deliberadas: estructural, sistémico y habilitador. Los enfoques estructurales se ocupan de las bases sobre las que se sustentan la política, la economía y la sociedad. Los enfoques

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[1] La sostenibilidad es un concepto normativo que no tiene un significado definitivo, ya que los valores básicos de equidad social, integridad medioambiental y bienestar humano son concebidos de forma divergente por grupos específicos en entornos diversos y particulares, y en distintos momentos (i.e., Leach et al. 2010a).

sistémicos son los que hacen hincapié en la necesidad de conocer la dinámica del sistema: la interdependencia de los elementos sociales, ecológicos, institucionales y tecnológicos que, en conjunto, marcan umbrales en los estados del sistema. Por último, los enfoques habilitadores centran sus esfuerzos en la agencia humana, creando capacidades sociales que puedan facultar a las personas para emprender acciones significativas para su beneficio. Estos tres enfoques no se excluyen mutuamente y comprenden lentes analíticos complementarios sobre el cambio transformador (Scoones et al. 2020). En esta investigación se hace hincapié en el enfoque habilitador.

Fomentar transformaciones deliberadas hacia la sostenibilidad sigue siendo un desafío importante para practicantes y académicos de la sostenibilidad. Dado que las transformaciones deliberadas requieren considerar tanto los resultados como el proceso, es esencial encontrar empíricamente qué características particulares del proceso pueden promover transformaciones (Shah et al., 2018). Además, una brecha fundamental en el trabajo de transformaciones es "cómo involucrarse con las luchas vividas, las aspiraciones y las esperanzas de diversos grupos de personas y cómo reflejarlas más plenamente" (Shah et al., 2018:258), y cómo involucrarse con diferentes interpretaciones de lo que comprende un futuro deseable en un contexto específico (Pereira et al. 2018a).

El concepto de transdisciplina se ha utilizado para abordar la necesidad de comprender las conexiones y relaciones de una realidad intrínsecamente compleja compuesta por múltiples actores con diferentes entendimientos. Aunque existen diversas definiciones y discursos en torno a este concepto, en esta investigación la transdisciplina se conceptualiza como un enfoque que trasciende la lógica disciplinaria fragmentada para examinar los retos de la sostenibilidad. Asimismo, la transdisciplina reconoce explícitamente que las comunidades de práctica fuera del mundo académico son co-partícipes del proceso de investigación y desempeñan un papel activo crucial en la experiencia de aprendizaje (Bernstein 2015; Klein 2015). Esto significa que la comunidad académica debe involucrar a los actores sociales en la co-creación de respuestas más alternativas y creativas para abordar los desafíos enmarcados por el grupo de actores sociales implicados. Por lo tanto, prestar atención al diseño de tales procesos transdisciplinarios es crucial para fomentar cambios transformadores hacia la sostenibilidad. Dichos 'procesos' implican la creación de 'espacios' participativos o de co-producción, como medios diseñados que se centran en las interacciones de los participantes que pueden promover los cambios deseados. Por ello, en esta investigación me referiré a partir de ahora a ellos como "espacios-procesos".

La agencia humana es un concepto implícito y a veces explícito en la literatura sobre transformación. La agencia se considera un ingrediente esencial para cualquier cambio eficaz y fundamental que pueda esperarse de las intervenciones de sostenibilidad (O'Brien & Sygna 2013; Westley et al. 2013; Pesch 2015; Marshall et al. 2018). La agencia se define como la capacidad de un individuo para actuar a favor de los objetivos establecidos por el propio agente, de acuerdo con sus valores (Sen 1999; Alkire & Deneulin 2009), y está determinada por los recursos, las relaciones de poder, pero también por las motivaciones, la cognición y las emociones (O'Brien 2012). Para

desarrollar agencia es necesario crear condiciones que fomenten una interacción iterativa de lo individual y lo colectivo para así crear un espacio que permita su emergencia en ambos niveles. Tales condiciones implican establecer un espacio cognitivo para fomentar la creación de sentido, pero también un espacio afectivo, ya que la agencia depende de la dinámica de afectación mutua en las interacciones sociales (O'Brien & Sygna 2013, Pesch 2015; Charli-Joseph et al. 2018; Maiese 2019). En consecuencia, la noción de agencia humana, y en el contexto de las transformaciones deliberadas más recientemente tipificada como agencia transformadora (e.g., Westley et al. 2013), debe ser central en el diseño de cualquier espacio-proceso destinado a generar una transformación significativa.

Dado que en la investigación transdisciplinaria los académicos y practicantes de la sostenibilidad intervienen intencionalmente en/con las comunidades y los sistemas para ayudar a crear las condiciones de cambio hacia la sostenibilidad, es esencial pensar en cómo tales intervenciones pueden permitir el surgimiento y la expresión de la agencia donde parece faltar. Los espacios-procesos transformativos brindan la oportunidad de explorar el potencial de tales intervenciones. Siguiendo la definición de Pereira et al. (2018b), los espacios transformativos son entornos colaborativos lo suficientemente seguros donde los actores que invierten en la transformación pueden experimentar con nuevos modelos mentales, ideas y prácticas que pueden ayudar a cambiar los sistemas socio-ecológicos hacia trayectorias alternativas. Los espacios transformativos permiten y posibilitan el diálogo, la reflexión y el aprendizaje reflexivo, al tiempo que se reencuadran los problemas de manera que se fomente la co-creación y la co-realización de soluciones (Pereira et al. 2018b).

Sin embargo, a menudo los equipos transdisciplinarios que se unen para trabajar de forma articulada en torno a una determinada cuestión socio-ecológica en respuesta a necesidades apremiantes y situaciones particulares, no poseen un diseño metodológico previo ni una planeación clara sobre qué formas de intervenciones participativas pueden ser más adecuadas para lograr los resultados deseados (Merçon et al. 2018). Los procesos participativos llevan mucho tiempo, son complejos y requieren creatividad, un compromiso genuino y suficiente tiempo para generar confianza entre las personas. Sin un diseño cuidadoso que tenga esto en cuenta, no se puede asegurar que se lleven a cabo procesos participativos prometedores. Asimismo, cuando se carece de esa planeación, no se puede confiar realmente en que una determinada intervención esté asociada a un resultado, ni es posible recuperar la lógica que subyace a la selección de una estrategia frente a otra para apoyar el aprendizaje dentro de un grupo o en distintos contextos. Por lo tanto, es decisivo diseñar cuidadosamente estos procesos y articular diversos tipos de métodos (Ramadier 2004), según el contexto específico en el que se producen (Schneider & Buser 2018). Esto implica también identificar los roles cambiantes de las personas que convocan dichos espacios transformadores. Los investigadores desempeñan múltiples funciones en este tipo de enfoques orientados a los procesos, en particular, en la generación y el mantenimiento de ese espacio en el que la ciencia y la sociedad abordan problemas del mundo real (Wittmayer & Schäpke 2014).

Por lo tanto, si bien existe un consenso cada vez mayor sobre la importancia de examinar y fomentar cambios más profundos, deliberados y no incrementales en los sistemas socio-ecológicos (e.g. O'Brien 2012; Olsson et al. 2014; Pelling 2014; Pelling et al. 2015; Abson et al. 2017), así como una aceptación creciente sobre el papel crucial que desempeña la agencia humana en fomentar procesos de transformación socio-ecológica (e.g. Westley et al. 2011; Westley et al. 2013), todavía no hay evidencia empírica suficiente, ni desarrollo metodológico en los criterios y métodos que contribuyen a cómo desarrollar una agencia colectiva para mejorar el potencial de intervenciones novedosas en desafíos de sostenibilidad (Tschakert et al. 2016; Abson et al. 2017; Charli-Joseph et al. 2018). En particular, todavía existe la necesidad de examinar y comprender más a fondo cómo diseñar e implementar espacios que puedan fomentar el surgimiento de la agencia colectiva, ya que muchos procesos parecen asumir su presencia o surgimiento, sin prestar atención específica a qué enfoques y herramientas podrían movilizarse para construir espacios susceptibles a su surgimiento.

La agencia humana en los procesos de transformación

Para algunos autores de las ciencias sociales y la filosofía, la agencia es la condición de una entidad para actuar por cuenta propia, es decir, realizar acciones intencionadas según los propios intereses (i.e., Barandiaran et al. 2009; Kauffman & Clayton 2006). De acuerdo con Hewson (2010), en las ciencias sociales se pueden identificar tres tipos de agencia 1) Agencia individual, 2) Agencia *proxy*, y 3) Agencia colectiva. La agencia individual es la más básica y se refiere a la actuación de los individuos. La agencia *proxy* es cuando alguien actúa en nombre de otro (por ejemplo, cuando un empleado actúa en nombre del empleador). La agencia colectiva es cuando un grupo de individuos se organiza de tal manera que actúa como un grupo. La agencia colectiva es más que la suma de las agencias individuales, ya que las intenciones y las acciones no pueden ser un atributo de un solo individuo, sino de un grupo estructurado de determinada manera que requiere cohesión social (ej., empresas, estados y movimientos sociales) (Hewson 2010).

En esta investigación, parte de la inspiración para conceptualizar la agencia humana proviene de un enfoque enactivista de la cognición (Barandiaran et al. 2009; Moreno & Mossio 2015; Siqueiros-García et al. 2018). Desde esta perspectiva enactivista, un agente cognitivo es un individuo que constituye activamente su propia identidad, esforzándose continuamente por sostenerla mientras se regula a sí mismo y a su acoplamiento con el entorno. Así, un agente humano hace algo por sí mismo en el entorno -actúa por sí mismo-, y lo hace de acuerdo con normas que emergen de la propia organización del agente y de su interacción con un entorno (Barandiaran et al. 2009, Moreno & Mossio 2015). Por tanto, el significado emerge de los aspectos normativos de la organización del agente y de su integración con el entorno. Este aspecto normativo da al agente un sentido de lo que es bueno o malo para su propia integridad (Siqueiros-García et al. 2018)[2].

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[2] La relación entre agencia y estructura se conceptualiza como una en la que tanto el nivel individual como el estructural se influyen o afectan mutuamente -como afirmaron Dwiartama y Rosin (2014), siguiendo a

Si bien la agencia humana es un tema recurrente en la evolución del pensamiento sobre la resiliencia y las ciencias de la sostenibilidad (i.e., Westley et al. 2013), todavía no existe un consenso sobre cómo operacionalizar el concepto en la investigación socio-ecológica y transformativa. La mayoría de las conceptualizaciones de agencia se basan en observaciones de las acciones de una entidad que encarna la agencia (es decir, los agentes hacen esto y aquello), en la que el agente mismo es una caja negra llena de intenciones. La dinámica de los SSE depende de las intenciones de los agentes humanos hacia el sistema, que incluyen esfuerzos deliberados para mantener o alterar las estructuras e identidad emergentes del sistema (Manuel-Navarrete 2015). Asimismo, dado que el enfoque de transformaciones implica cambios deliberados, está íntimamente ligado a la noción de agencia. Sin embargo, todavía hay una falta de evidencia empírica sobre cómo identificar, fomentar y medir la agencia.

Fomentando la agencia a través de reencuadrar

Situar la agencia humana en el centro de las transformaciones socio-ecológicas destaca la participación intrínseca de los humanos en las estructuras emergentes de los SSE, pero debido a la complejidad del sistema, invocar el surgimiento de una transformación deseable requiere que los agentes 'vean' y 'sientan' más claramente una situación[3] para reconocer que ellos, como agentes, están integrados en el sistema[3]. Por lo tanto, los procesos auto-reflexivos pueden desafiar, transformar y abrir los marcos de referencia a través de los cuales un individuo conoce y se comporta en el mundo (Mezirow 2000). La auto-reflexividad tiene como objetivo la transformación de los marcos internos de referencia desde los que un individuo entiende las estructuras del sistema, los roles, las situaciones problemáticas, y su relación con el mundo (Scott 2003). Dado que la transformación es relacional, se facilita mejor en un entorno colectivo, ya que es a través de la puesta en perspectiva del propio marco de referencia con los de los demás que surgen nuevos marcos de referencia ampliados (Scott 2003). En este sentido, los procesos de reflexividad y reencuadre, tanto individuales como colectivos, son preocupaciones centrales en el diseño de métodos y espacios para explorar las transformaciones hacia la sostenibilidad.

Giddens (1984), la importancia de ir "más allá del dualismo estructura-agencia a través de lo que él llama la dualidad de la estructura; es decir, los agentes están limitados por, y al mismo tiempo reproducen, la estructura a la que están constreñidos" (Dwiartama and Rosin 2014).

[3] *Situación*: Entendida como una experiencia desde una perspectiva en primera persona; una constelación particular de relaciones que da lugar a oportunidades y obstáculos. En una situación particular (también concebida como "experiencia vivida" en la obra de Paulo Freire), un individuo puede entender un sistema desde una posición espacial y temporal específica, según la condición del individuo de estar allí en ese lugar y en ese momento.

 Sistema: Descripción de los componentes y sus interacciones, pero no necesariamente dentro de una interpretación normativa (i.e., causas/oportunidades de cambio).

Un enfoque que se centra en los procesos de reencuadre es el de las vías hacia la sostenibilidad (Leach et al. 2007; 2012). Este enfoque implica examinar las posibles direcciones (determinadas por diversos marcos o encuadres) en las que los sistemas sociales, tecnológicos y ecológicos que interactúan pueden co-evolucionar hacia estados más sostenibles. En particular, este enfoque intenta facilitar espacios para debatir las direcciones que pueden apoyar caminos alternativos (es decir, más plurales, justos y sostenibles) (Ely 2021). A menudo, diferentes individuos se reúnen para deliberar qué decisión tomar, y con frecuencia algunos pueden no ser conscientes de cómo su contexto o formación socio-política y cultural específica (es decir, sus posicionamientos) pueden afectar las acciones que tienen a su disposición. Dado que los procesos de decisión son posicionados y parciales, y están moldeados por las posiciones y los marcos socioeconómicos-políticos de los involucrados, este enfoque busca cuestionar cómo estos procesos internalizan las posiciones[4] y los marcos que pueden reflejar y reiterar implícitamente esos marcos sin ser cuestionados (Stirling 2008).

El enfoque de las vías hacia la sostenibilidad postula que la reflexividad es necesaria para 'abrir' espacios que desafíen constructivamente los marcos de los agentes sobre un problema o situación, así como sus narrativas sobre las vías preferidas para el cambio socio-ecológico (Manuel-Navarrete & Pelling 2015). A través de su enfoque en la reflexividad, pero también en los procesos de auto-reflexión en torno a la examinación de los marcos (formados por creencias, valores, límites simbólicos, agendas, objetivos, o métodos), el enfoque de vías hacia la sostenibilidad contribuye a la formalización de la agencia humana en la dinámica de los SSE (Stirling 2008; Barnett et al. 2014; Wise et al. 2014). En consecuencia, destaca las subjetividades dinámicas (y múltiples, a veces contradictorias) de los agentes (es decir, nuestras preocupaciones e identidades personales únicas) en lugar de sus posiciones socio-ecológicas 'objetivas'. Por lo tanto, según este enfoque, el desarrollo de la agencia humana, aunque evidentemente depende de los recursos (i.e., financieros/humanos) y del poder (i.e., la capacidad de resistir/evadir/manipular/cumplir), conlleva la creación de marcos y narrativas sobre vías de cambio transformadoras (Marshall et al. 2021).

Los espacios-procesos transformativos tienen como objetivo facilitar cambios transformadores hacia un futuro más sostenible y justo; la implicación es que la transformación social es una actividad colectiva, y los espacios-procesos diseñados pueden facilitar las interacciones sociales necesarias para catalizar dicho cambio. Debido a que los procesos de transformación necesariamente deben mediar las perspectivas y subjetividades individuales con el imperativo de generar significados y objetivos compartidos, es crucial obtener, comprender y compartir los marcos particulares de los participantes (Eakin et al. 2019b). En consecuencia, ha habido un

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[4] *Posicionalidad*: Una postura o posición relativa (intrínsecamente política en su sentido más amplio) que delimita/denota cómo un individuo da sentido al mundo, tanto a sí mismo como a los demás. En esta investigación, el concepto de posicionalidad deriva de una combinación de la noción de sujeto de la fenomenología (como sujeto se tiene una experiencia particular temporal y situada), y de la teoría de las redes sociales (tener una experiencia vivida es relacional, ya que surge de las relaciones con los demás).

creciente interés en estudiar los procesos cognitivos asociados (i.e., aprendizaje de doble y triple bucle, reflexividad, y procesos de reencuadre) de los agentes que participan en dichos espacios (Pahl-Wostl 2006; Lyon & Parkins 2013; Lumosi et al. 2019), como estrategias para promover el cambio conceptual y de comportamiento.

Si bien la agencia es un concepto central en la literatura sobre transformaciones hacia la sostenibilidad, poco se ha dicho sobre la conexión entre los procesos de reencuadre y la agencia. En esta investigación se argumenta que para que la agencia colectiva sea transformadora, su emergencia debe implicar una reformulación de la situación del problema y de los roles y posiciones de los agentes en un sistema. El reencuadre requiere herramientas y métodos de participación específicos para crear espacios lo suficientemente seguros donde los participantes puedan ser vulnerables y abrirse (Ramadier 2004). Los espacios transformadores, por lo tanto, pueden potencialmente permitir reencuadrar una situación de manera que permita el surgimiento de la agencia colectiva.

Los laboratorios de transformación

El concepto de 'laboratorio' se ha movilizado como medio para captar la idea de un espacio o conjunto de actividades colaborativas diseñadas para apoyar procesos sociales experimentales, destinados a abordar complejos retos sociales y ambientales (e.g., *los laboratorios de transición, los laboratorios de alimentación, los laboratorios de cambio*, etc.). Por ejemplo, los *laboratorios de innovación social* se definen como "...procesos altamente diseñados y facilitados por expertos, destinados a apoyar a grupos de múltiples partes interesadas para abordar un problema social complejo" (página 7, Guía de Laboratorios de Innovación Social). El enfoque de los *laboratorios de transformación* (o T-Labs, por sus siglas en inglés) fue adaptado del concepto de laboratorios de innovación social (Westley & Laban 2012), con el objetivo principal de desarrollar un espacio en el que los participantes puedan probar múltiples soluciones o estrategias para el cambio, que en conjunto podrían abordar un desafío socio-ecológico. Este enfoque fue diseñado para ayudar a enmarcar colectivamente un desafío, crear prototipos tempranos de 'intervenciones', fomentar impulso para la acción, mientras se fortalece la capacidad de los agentes de cambio para abordar el desafío en cuestión, y por lo tanto, fomentar las transformaciones hacia la sostenibilidad.

Las siguientes condiciones se propusieron para identificar cuándo convocar un proceso de T-Lab: a) la existencia de una situación dominante que debe ser desafiada, reconocida como una cuestión socio-ecológica compleja sin solución clara; b) la existencia de un disenso sobre la cuestión (es decir, diversas perspectivas que ven la cuestión o el problema de manera diferente); c) una historia de experimentos infructuosos con soluciones alternativas y la sensación de que la práctica actual ya no es una opción; d) una concientización colectiva de la urgencia del cambio; e) la presencia de un 'convocante' con una importante apropiación del problema y una fuerte motivación para apoyar la emergencia de la agencia de los participantes; f) la identificación de una oportunidad de transformación (Pathways 2021; Pereira et al. 2021).

Por lo tanto, el énfasis de los T-Labs no se centra únicamente en la búsqueda creativa de soluciones o intervenciones novedosas, con la participación de múltiples partes interesadas. Los T-Labs también pueden centrarse en facilitar el aprendizaje colectivo sobre la naturaleza de un problema o desafío, y sobre diferentes tipos de soluciones potenciales, o vías de cambio posibles. En consecuencia, los T-Labs tienen como objetivo identificar qué actores tienen capacidad de transformación, ayudando a crear un sentido colectivo de la necesidad de cambio, dentro y fuera de las partes interesadas directamente implicadas, mediante la co-construcción de estrategias para afectar al cambio (Pereira et al. 2021). Al posicionar las múltiples intenciones en vías colectivamente deseables (Olwig 2012; Haasnoot et al. 2013), los T-Labs son espacios-procesos en los que el objetivo del enfoque de las vías hacia la sostenibilidad para 'abrir' y hacer futuros plurales sucede. Por lo tanto, el enfoque de los T-Labs ha surgido como un medio para proporcionar espacios de innovación interactivos que permiten la experimentación con nuevas configuraciones de sistemas socio-tecno-ecológicos y vías de sostenibilidad.

Esta investigación estudió el caso de un proceso de T-Lab diseñado para abordar, en un contexto de multi-actoral, el nexo entre la urbanización, la conservación de los humedales y la sostenibilidad de los medios de vida en el sistema del humedal urbano de Xochimilco, Ciudad de México (Eakin et al. 2021). El sistema de humedales de Xochimilco representa un conjunto de problemas complejos ya que involucra varios componentes biofísicos, sociopolíticos y culturales que interactúan, con interdependencias no triviales. Este sistema de humedales ha estado en un proceso de degradación desde hace varias décadas y actualmente se encuentra contaminado por los desechos urbanos, las actividades agrícolas y el turismo (Mazari-Hiriart et al. 2008; Zambrano et al. 2009). Además, representa el último remanente del sistema lacustre de la Cuenca de México y de los humedales prehispánicos de un agroecosistema que alguna vez fue la base del desarrollo agrícola de la Ciudad de México. Aunque se han estudiado y abordado ampliamente diferentes aspectos del problema, los enfoques anteriores no han dado resultados significativos (González-Morán et al. 1999; Clauzel 2009; Merlín-Uribe et al. 2012). Por lo tanto, este caso de estudio se identificó como particularmente apto para explorar cómo un proceso de T-Lab podría potencialmente fomentar la agencia colectiva, como primer paso en cualquier proceso de cambio transformador (Eakin et al. 2021).

A pesar de las complejas relaciones de causalidad, complicidad y culpa, la política en torno a la degradación de Xochimilco se inscribe en una narrativa que enfrenta a los asentamientos irregulares con los chinamperos más tradicionales, y a las comunidades agrícolas y urbanas dependientes del humedal en conflicto con la ciudad y las instituciones federales que consideran que hacen muy poco para proteger sus intereses (Eakin et al. 2019a; Siqueiros-García et al. 2022). En este contexto político y de organización social fragmentada, el T-Lab se centró en la persistente tensión sobre la tenencia de la tierra y el uso del agua entre dos grupos locales: los chinamperos y los habitantes de asentamientos irregulares. En vez de enmarcar el proceso del T-Lab en una narrativa de un estado no solidario, el objetivo fue centrarse en las relaciones de los actores dentro

del sistema socio-ecológico y directamente dependientes de él, y en su agencia individual y colectiva para el cambio transformador.

I.II. Preguntas de investigación y objetivos

La pregunta central de investigación de este trabajo fue: ¿Cómo la teoría sobre transformaciones se puede operacionalizar a través de intervenciones transdisciplinarias diseñadas para fomentar agencia colectiva? De esta pregunta central, se desprendieron las siguientes tres preguntas de investigación particulares: 1) ¿Cómo la identificación y el reconocimiento de la agencia individual pudiera apoyar la emergencia de la agencia colectiva?; 2) ¿Cómo los agentes perciben sus roles en las dinámicas del sistema socio-ecológico, y cómo esta percepción cambia mientras su noción de agencia evoluciona?; y 3) ¿Qué actividades y procesos podrían producir cambios observables en la agencia individual y colectiva?

Figura 1a. Representación esquemática de un espacio-proceso para promover agencia

La hipótesis principal fue que la agencia colectiva pudiera lograrse a través de la creación de un espacio donde se den procesos de reencuadre del sistema (Fig. 1a y Fig. 1b) y reflexión sobre las capacidades individuales y del grupo; y dichos procesos podrían facilitar la emergencia de valores compartidos que, a su vez, fomenten la consolidación de una identidad y eventualmente, activen los mecanismos para interactuar con el sistema socio-ecológico y para explorar trayectorias novedosas. Así, las actividades que promueven reflexividad, reencuadre de problemas, y reconocimiento de las capacidades individuales proporcionan las condiciones para la aparición de la agencia colectiva. Este proceso puede dar lugar a transformaciones individuales en los significados y en la comprensión como base esencial para fomentar nuevas colaboraciones entre los grupos sociales y para explorar nuevas trayectorias hacia el futuro.

Para responder las preguntas de investigación realicé una disertación con el objetivo central de diseñar e implementar un proceso destinado a identificar y construir una agencia colectiva a través de métodos participativos. Los métodos tenían el objetivo de fomentar el reencuadre intencional del problema, la interrogación de valores y suposiciones, y desafiar a los agentes a reflexionar y potencialmente alterar las caracterizaciones de referencia de su agencia en el sistema, con el objetivo último de abrir nuevas trayectorias de cambio (ver **Capítulo II** para el diseño

Figura 1b. Representación esquemática del proceso de reencuadre para fomentar agencia colectiva

metodológico general). A partir de este objetivo central, se persiguieron seis objetivos específicos: 1) Identificar la red social individual basada en los instrumentos particulares de la agencia del agente; 2) Identificar cómo los participantes conceptualizan el sistema y su posición en este; 3) Identificar la percepción de los participantes hacia cuestiones de conservación, urbanización, derechos de propiedad y agua, etc. con el fin de analizar cómo diferentes agentes reconocen la relevancia de atributos específicos del sistema; 4) Evaluar las formas en que las actividades colectivas y las intervenciones podrían fomentar la emergencia de la agencia colectiva; 5) Fomentar las capacidades del agente colectivo para abrir y explorar posibles vías hacia la sostenibilidad; 6) Identificar y observar el grado de agencia colectiva como resultado de las intervenciones.

Dado que esta investigación fue más propositiva que empírica, se enmarca dentro de un enfoque de investigación participativa, particularmente en el campo de la investigación acción participativa (i.e., Fals-Borda 1987; McIntyre 2007; Merçon 2018). En este sentido, esta investigación tuvo como objetivo contribuir a la generación de conocimiento original en la línea de investigación "Gobernanza, planeación colaborativa y aprendizaje social" del Programa de doctorado en Ciencias de la Sostenibilidad UNAM, mediante el estudio de formas alternativas de enfoques de planeación colaborativa destinados a involucrar y empoderar a los participantes para explorar diferentes trayectorias de cambio.

Esta investigación fue parte de un proyecto internacional llamado *"Pathways Network - Transformative Pathways to Sustainability: learning across disciplines, contexts and cultures"* financiado por el Consejo Internacional de la Ciencia (ISC, por sus siglas en inglés), a través del Programa "Transformaciones hacia la Sostenibilidad", que se centró en la creación de experiencias de aprendizaje entre comunidades no académicas y académicas, a través del desarrollo de métodos
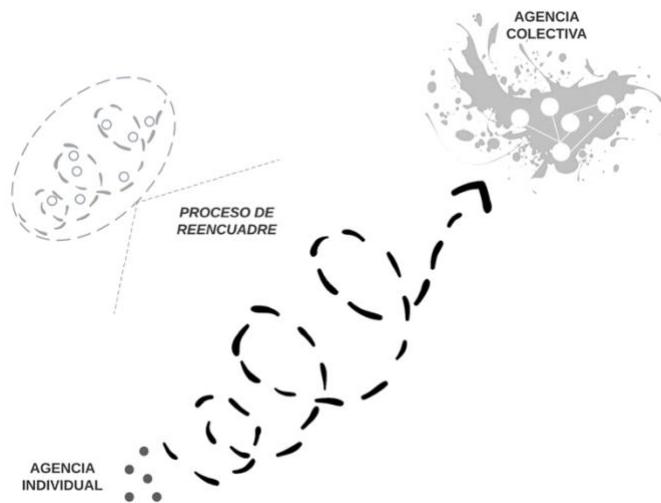
de investigación inter y transdisciplinarios en seis lugares estratégicos del mundo (México[5], India, Argentina, Inglaterra, China y Kenia). Cubrió un lapso de tres años (2016-2019), durante los cuales los seis nodos experimentaron con el enfoque de T-Labs, cada uno adaptándolo para considerar su contexto específico, diseñando una serie de interacciones para explorar cómo trabajar con diversos agentes en las transformaciones sociales en el contexto del cambio socio-ecológico. Esto implicó tanto 'entrar' en la dinámica del proceso social (i.e., investigación acción participativa), como apartarse para explorar analíticamente lo que estaba sucediendo. Los aprendizajes se compartieron de forma iterativa entre los nodos para contribuir a la comprensión de los elementos necesarios y las diversas condiciones para fomentar las transformaciones hacia la sostenibilidad.

A través de esta investigación se obtuvieron diversos productos. Los dos artículos científicos centrales para esta tesis (y como primera autora) son:

- **Charli-Joseph L**, Siqueiros-Garcia J, Eakin H, Manuel-Navarrete D, & Shelton R. 2018. **Promoting agency for social-ecological transformation: a transformation-lab in the Xochimilco social-ecological system**. *Ecology and Society* 23(2):46. link
  - ➔ Este artículo representa el artículo de requisito para titulación. En este artículo se exploraron las dos primeras preguntas de investigación de este trabajo: *1) ¿Cómo la identificación y el reconocimiento de la agencia individual pudiera apoyar la emergencia de la agencia colectiva?; y 2) ¿Cómo los agentes perciben sus roles en las dinámicas del sistema socio-ecológico?*. Consecuentemente, se atendieron los objetivos 1, 2 y 3, y se describió cómo se obtuvo la línea base para la agencia individual (ver **Capítulo III**).

- **Charli-Joseph L,** Siqueiros-García JM, Eakin H, Manuel-Navarrete D, Mazari-Hiriart M, Shelton R, Pérez-Belmont P., & Ruizpalacios B. 2022. **Enabling collective agency for sustainability transformations through reframing in the Xochimilco social-ecological system.** *Sustainability Science (aceptado, próxima publicación)*.
  - ➔ Este artículo representa el segundo manuscrito de requisito, y en el cual se exploró la segunda parte de la pregunta de investigación 2 (*¿cómo la percepción del rol de los agentes cambia mientras su noción de agencia evoluciona?*); junto con la pregunta de investigación 3 (*¿Qué actividades y procesos podrían producir cambios observables en la agencia individual y colectiva?*). Por ende, se atendieron los objetivos 4, 5 y 6 (ver **Capítulo IV**).

Debido a que esta investigación fue parte de un proyecto internacional con una diversidad de colaboraciones en donde se compartían aprendizajes constantemente, se desarrollaron otros productos que también emanaron directamente del proceso y hallazgos de esta investigación. En el **Capítulo V** se enlistan y se describe brevemente la relación particular de dichos productos con esta investigación.

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[5] Proyecto de la red Pathways – Cd. Mx - Implementado por LANCIS-IE-UNAM, y la Universidad Estatal de Arizona, ambos conforman el Nodo Norteamérica que es parte del Consorcio Global STEPS Pathways to Sustainability.

II. Aspectos metodológicos generales

El enfoque T-Lab

Partiendo de una perspectiva de investigación-acción, esta investigación exigió que la investigadora fuera explícitamente consciente de su papel y fuera reflexiva en cuanto al proceso y las relaciones sociales dentro del esfuerzo de investigación. El principal interés de la investigación se centró en el mundo cognitivo-afectivo de los participantes más que en la realidad "objetiva" del sistema socio-ecológico. Por lo tanto, este trabajo fue interpretativo, basado en el realismo y el pragmatismo. Sin embargo, esto también conllevó un distanciamiento del proceso a través de las medidas más cuantitativas para ayudar a captar los posibles cambios y aprendizajes, de forma menos filtrada por la lente interpretativa de la investigadora (ya que los investigadores pueden estar sesgados en la búsqueda de cambios cuando orquestan una intervención).

El enfoque particular del T-Lab implicó un proceso para promover y nutrir un espacio suficientemente seguro para la transformación potencial a través de una serie de actividades que pudieran 'abrir' el diálogo para fomentar colaboraciones novedosas y una agencia colectiva potencial para abordar el problema de la urbanización progresiva en un sitio cultural, ecológica y políticamente importante. Por tanto, el enfoque se diseñó para poner en marcha un proceso de colaboración que, de tener éxito, crearía condiciones favorables para la aparición de un sentido de agencia colectivo. Aunque la agencia por sí sola no resuelve los retos del humedal de Xochimilco, este enfoque postuló que era un primer paso necesario para encontrar vías de desarrollo alternativas para el sistema. Así, se reunió a una diversidad de actores involucrados en el uso y manejo del humedal urbano de Xochimilco para que participaran y ayudaran a diseñar una serie de actividades experimentales que crearan la "arquitectura social" favorable para la transformación.

Criterios de muestreo para el grupo T-Lab

La identificación de los participantes es un paso fundamental para cualquier proceso de deliberación colectiva, aunque rara vez se describe en la literatura. Se pueden seguir diferentes enfoques para reclutar a los participantes. La literatura actual sobre agencia y transformación hace demasiado hincapié en la importancia de los 'líderes' para guiar y promover el cambio. El liderazgo, al igual que muchos atributos personales valiosos, depende de la cultura. En este sentido, y basándose en experiencias anteriores en el área, este proyecto desafió la idea de liderazgo aplicable a los agentes de cambio (e.g., Westley et al. 2013), dado que en algunos casos la primacía del grupo (en oposición a la del líder) es social y culturalmente más significativa (Turchin 2015). No obstante, lo que importa es el conjunto de características relevantes que los individuos aportan a un proceso. Así, los criterios sobre liderazgo y agentes de cambio[6] de la literatura existente,

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[6] "Actores que ejercen su agencia individual para innovar y crear un cambio sostenible y aceptado en los sistemas en los que operan" (Vervoort et al. 2012)

principalmente de Westley et al. (2013), fueron modificados para reconocer el contexto local. Para este caso, el proyecto se basó en informantes clave que habían participado en proyectos anteriores de investigación en la zona, y en métodos de bola de nieve.

En consecuencia, los criterios para formar un grupo de participantes fueron los siguientes (1) diversos tipos de conocimiento sobre el área; (2) redes sociales accionables, por ejemplo, a través de proyectos previos de desarrollo de capacidades, trabajo colectivo organizado, afiliaciones institucionales, etc.; (3) capacidad y voluntad de experimentar con diferentes enfoques; (4) determinación y voluntad tanto de conservar los atributos socio-ecológicos del sistema como de cambiar las condiciones actuales que lo obstaculizan; (5) algún sentido de apego al lugar (i.e., humedal de Xochimilco); (6) experiencia en actividades alternativas, por ejemplo, agricultura orgánica, ecoturismo, ecotecnologías; (7) solidaridad y empatía con respecto a otros miembros del grupo; y (8) experiencia de trabajo en problemas de desarrollo comunitario e innovación de base (Charli-Joseph et al. 2018).

Composición del grupo

La muestra total fue de 19 individuos, algunos de los cuales no se conocían antes del proyecto. El grupo estuvo compuesto por participantes que podían actuar en diferentes niveles de acción, es decir, desde proyectos locales (chinamperos) hasta proyectos globales (i.e., la anterior 100 Ciudades Resilientes) y desde dentro del sistema de humedales, hasta más allá de sus fronteras. Por lo tanto, el conjunto de participantes incluía una variedad de agentes que abarcaban diversos ámbitos de acción, tanto políticos como académicos.

La composición de la muestra total de individuos fue la siguiente. Nueve participantes pertenecían a la sociedad civil: cinco de ellos eran chinamperos de diferentes áreas y tipos de producción, dos trabajaban en proyectos de desarrollo de capacidades en la zona (estrechamente vinculados al mundo académico), un residente que trabajaba en el activismo de los asentamientos irregulares, y un artista. Cuatro participantes eran agentes gubernamentales del ámbito municipal y federal, que trabajaban en las áreas de urbanización, conservación de humedales y cambio climático, en la aplicación y cumplimiento de la normativa medioambiental, y en iniciativas de resiliencia de la ciudad. Tres participantes eran académicos: todos ellos trabajando en el ámbito de la calidad del agua, en la conservación, y en esquemas de producción sostenible. Tres participantes pertenecían a organizaciones no gubernamentales: uno trabajaba en técnicas de captación de agua de lluvia, otro pertenecía a una organización no gubernamental local que promueve prácticas agrícolas sostenibles, y otro trabajaba en proyectos urbanos sostenibles.

Al principio del proyecto se identificaron dos grandes categorías de participantes según su papel potencial en el proceso del T-Lab. Dado el objetivo de habilitar capacidades para incidir potencialmente en el cambio del sistema, se pensó que el primer tipo de participantes debían ser agentes que pudieran ser considerados como cruciales para apoyar la construcción de alianzas, ya

que se hipotetizó que las alianzas eran necesarias para desarrollar nuevas formas de relacionarse con otros actores que no formaban parte de una red de colaboradores existente. Estos agentes fueron identificados por su sector de trabajo, atribución, responsabilidad, experiencia y conocimientos diversos (como ciertos académicos de alto nivel, y tomadores de decisiones del gobierno federal) para que actuaran como informantes del proceso, pero no necesariamente para que participaran durante las interacciones colectivas -en cierto sentido, podrían pensarse como acompañantes que podían escoltar y dar un apoyo adicional a las iniciativas del grupo central. El número total de este subgrupo de informantes clave fue de 6.

El segundo grupo de agentes estuvo más cerca del proceso de colaboración, centrándose en los criterios adaptados para los agentes de cambio mencionados anteriormente. Esto incluía la incorporación de personas de 'fuera' -individuos con experiencia trabajando en problemas de desarrollo comunitario e innovación de base, pero que no necesariamente se ocupan de los principales problemas de la zona-, así como de personas de 'dentro' -individuos que trabajan y viven en la zona-. Este segundo conjunto de agentes fue el que conformó el proceso destinado a crear un agente colectivo, compuesto por un subgrupo de 13 participantes que formaron el núcleo del grupo T-Lab, y que fueron invitados a participar en todas las actividades descritas en esta investigación.

Diseño metodológico

Las actividades desarrolladas a lo largo de las diferentes interacciones en este proyecto de investigación involucraron: a) Entrevistas semi-estructuradas individuales con ejercicios reflexivos (aproximadamente 5 iteraciones para recoger diversos testimonios y desarrollar Q-sorts, mapas cognitivos y redes de agencia -ver Charli-Joseph et al. 2018 para detalles sobre la identificación de la agencia individual y los métodos desarrollados para ello); e b) Interacciones grupales (aprox. 11) -como talleres participativos, reuniones y visitas de campo a través de *walkshops*- (ver Fig. 2 para una indicación de la línea de tiempo a lo largo de casi 3 años).
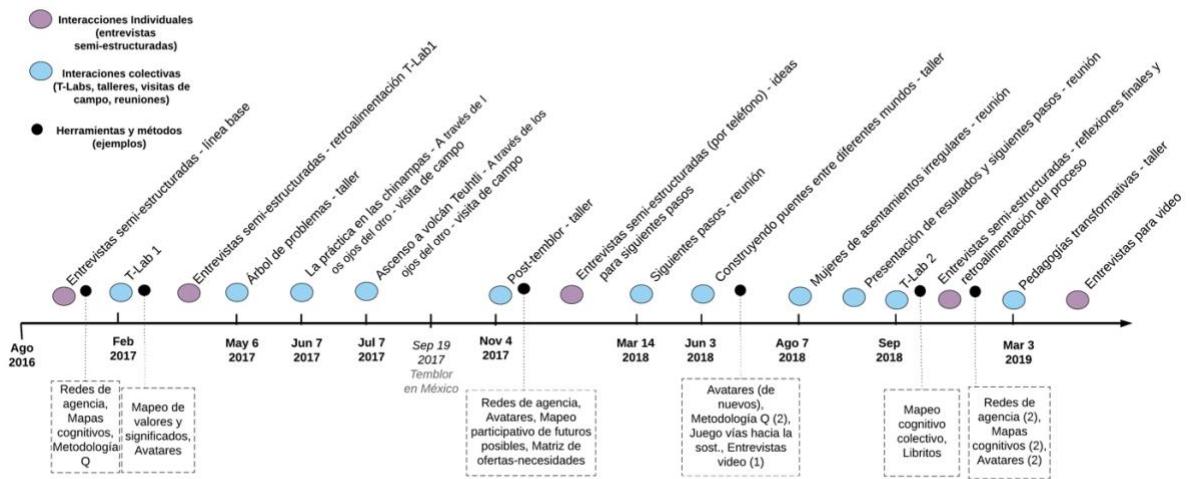
Figura 2. Interacciones individuales y colectivas a través del proyecto de investigación

En la Tabla 1 se indica la relación entre las preguntas de investigación, las hipótesis, los objetivos y los métodos utilizados en esta investigación.

Tabla 1. Articulación general entre las preguntas de investigación, las hipótesis, los objetivos y los métodos.

Preguntas de investigación	Hipótesis	Objetivos	Métodos
Pregunta de investigación general ¿Cómo la teoría sobre transformaciones se puede operacionalizar a través de intervenciones transdisciplinarias diseñadas para fomentar agencia colectiva?	**Hipótesis principal** La agencia colectiva pudiera lograrse a través de la creación de un espacio donde se den procesos de reencuadre del sistema y reflexión sobre las capacidades individuales y del grupo; dichos procesos podrían facilitar la emergencia de valores compartidos que, a su vez, fomenten la consolidación de una identidad y eventualmente, activen los mecanismos para interactuar con el sistema socio-ecológico y para explorar trayectorias novedosas.	**Objetivo central** Diseñar e implementar un proceso destinado a identificar y construir una agencia colectiva a través de métodos participativos (dirigidos a fomentar la reformulación intencional del problema, la interrogación de valores y suposiciones, y desafiar a los agentes a reflexionar y potencialmente alterar las caracterizaciones de referencia de su agencia en el sistema, con el objetivo último de abrir nuevas vías de cambio)	Resumen de los métodos cualitativos-cuantitativos: - Análisis de redes sociales, - Mapeo cognitivo, - Metodología Q, - Entrevistas semi-estructuradas, - Observación participante, - Métodos participativos para interacciones transdisciplinarias (ej., mapeo participativo en talleres, *walkshops*).
¿Cómo los agentes perciben sus roles en las dinámicas del sistema	Cuando los marcos de un grupo se modifican a través de un proceso	1) Identificar la red social individual basada en los	- Análisis de redes sociales (redes egocéntricas individuales y redes de

socio-ecológico, y cómo esta percepción cambia mientras su noción de agencia evoluciona? ¿Cómo la identificación y el reconocimiento de la agencia individual pudiera apoyar la emergencia de la agencia colectiva?	participativo intencional, como un T-Lab, la agencia colectiva del grupo también puede verse afectada. El paso de la agencia individual a la colectiva puede producirse en un proceso reflexivo orquestado de reencuadre de la situación o del problema.	instrumentos particulares de la agencia del agente	acción individuales*) a través de entrevistas semi-estructuradas; - Avatares** *[línea base y cambio]*
		2) Identificar cómo los participantes conceptualizan el sistema y su posición en este.	- Mapeo cognitivo*** a través de entrevistas semi-estructuradas; -Avatares *[línea base y cambio]*
		3) Identificar la percepción de los participantes hacia cuestiones de conservación, urbanización, derechos de propiedad y agua, etc. con el fin de analizar cómo diferentes agentes reconocen la relevancia de atributos específicos del sistema.	- Metodología Q a través de entrevistas semi-estructuradas *[línea base y cambio]*
¿Qué actividades y procesos podrían producir cambios observables en la agencia individual y colectiva?	Un proceso de reencuadre puede tener lugar en un espacio 'suficientemente seguro' (física, social y cognitivamente), en el que los participantes puedan reflexionar sobre sus propios supuestos, relaciones y capacidades, y explorar y reflexionar colectivamente sobre significados alternativos y capacidades de grupo, que en conjunto refuerzan la agencia colectiva.	4) Evaluar las formas en que las actividades colectivas y las intervenciones podrían fomentar la emergencia de la agencia colectiva.	- Observación participante; - Entrevistas semi-estructuradas; - Libritos****
		5) Fomentar las capacidades del agente colectivo para abrir y explorar posibles vías hacia la sostenibilidad.	Talleres participativos con técnicas y herramientas como: - Marco de los 3 Horizontes; - Mapeo de valores y significados; - *Walkshops*; - Maquetas de mundos posibles; - Juego - Vías hacia la Sostenibilidad
		6) Identificar y observar el grado de agencia colectiva como resultado de las intervenciones.	- Análisis de redes sociales; - Metodología Q; - Entrevistas semi-estructuradas

* Ego-net: Red social egocéntrica para obtener la relación del 'ego' (el entrevistado) con sus 'alters'(colaboradores en el espacio del problema). Estas relaciones se representan en términos de sus posiciones en círculos concéntricos, con el ego en el centro.

Red de acción: Red social bipartita para representar las relaciones de los actores en términos de los tipos de actividades en las que colaboran juntos, representando así formas de agencia dentro del sistema.

https://github.com/sostenibilidad-unam/tlabs/blob/master/ANA.md

https://steps-centre.org/pathways-methods-vignettes/agency-network-analysis/

** Avatar: Un animal, planta, símbolo o personaje fantástico que los participantes ilustran en grandes hojas de papel y le dan un nombre, con un conjunto de atributos y capacidades (poderes) auto-identificados. Los avatares se idearon por tres razones principales: 1) El avatar es un proxy de un agente y, por tanto, representa al agente, pero no es el agente en sí; puede encarnar diferentes poderes y éstos pueden cambiar a lo largo del proceso; 2) Aunque los poderes tienen su propio significado como parte de un avatar, éstos adquieren más relevancia cuando los avatares crean sinergias con los poderes de otros; y, 3) Cuando los avatares interactúan, pueden llegar a reconocer que poseen otros poderes que no sabían que tenían al principio del proceso. https://github.com/sostenibilidad-unam/tlabs/tree/master/Avatars

*** Mapa cognitivo: Grafo dirigido en el que las conexiones entre variables representan interacciones de causa y efecto. Para analizar y comparar la percepción del sistema por parte de los entrevistados, en cada mapa cognitivo se identificaron las variables (nodos) según sus propiedades de posición de causa y efecto. https://github.com/sostenibilidad-unam/tlabs/blob/master/ANA.md

**** Libritos (o *Tiny Books* en inglés): Cuadernos elaborados por los participantes para contar una historia. Pueden servir de vehículo para compartir ideas a través de preguntas que desencadenen reflexiones, en un proceso de diálogo que permita destilar historias que se plasman de forma muy sintética (ya sea en narraciones escritas o ilustradas). https://transgressivelearning.org/2018/08/24/transgressive-learning-through-a-tiny-library/

La mayoría de las herramientas y métodos utilizados en esta investigación se explican en una guía (*El Laboratorio de Transformación del sistema socio-ecológico de Xochimilco, Ciudad de México: Descripción del proceso y guía metodológica*) que se elaboró para los participantes del proyecto y otros actores interesados en implementar procesos participativos (en versiones español e inglés).

La Figura 3 muestra el diseño metodológico global que se siguió. La primera columna presenta los métodos y herramientas utilizados para cada objetivo; la segunda y tercera columna indican los principales productos.
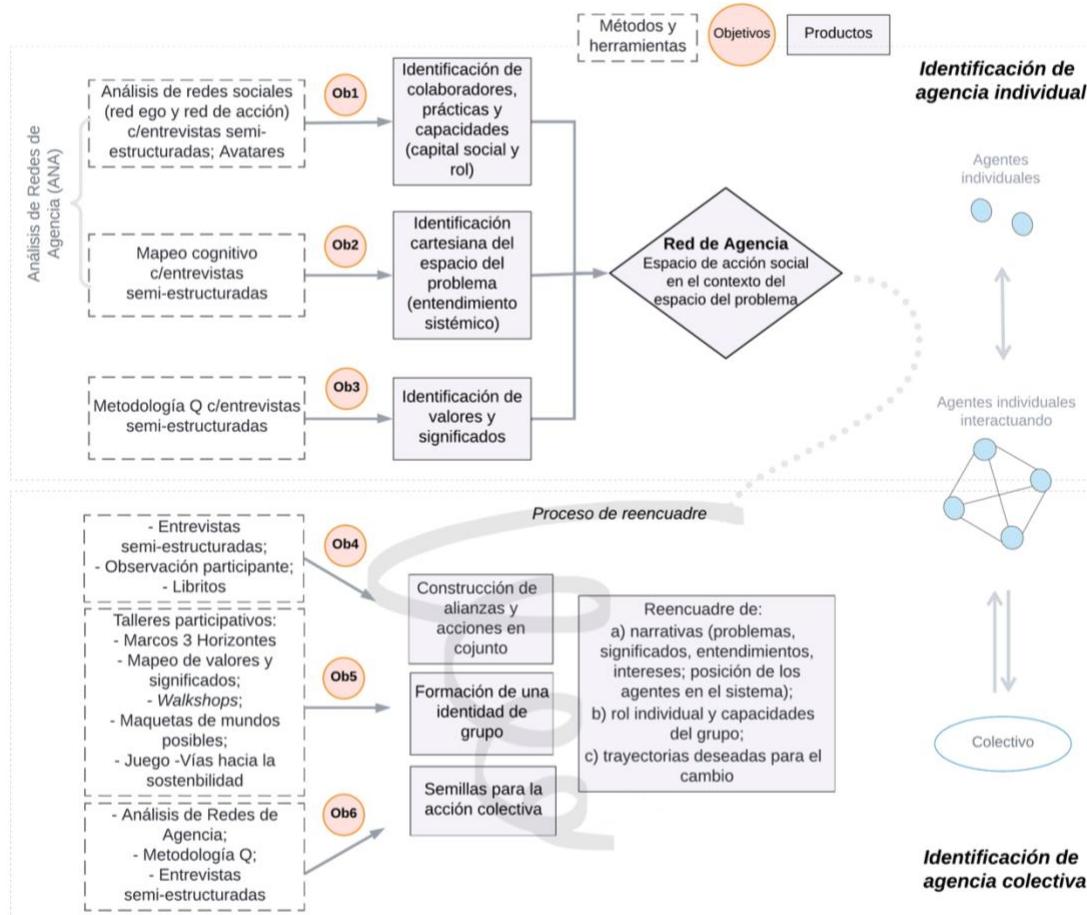
Figura 3. Diseño metodológico global para la construcción de la agencia a través de dimensiones relacionales, materiales y normativas.

Aspectos éticos de la investigación con humanos

En el marco de la Iniciativa de Colaboración para la Formación Institucional (Programa *CITI - Collaborative Institutional Training Initiative*), tomé un curso básico para obtener la certificación en Conducta Responsable en la Investigación *(Course Learner Group: Social and Behavioral Responsible Conduct of Research; Stage 1 - Basic Course https://about.citiprogram.org/course/responsible-conduct-of-research-basic/)*.

Dado que el propósito del proyecto fue generar capacidades de aprendizaje, tanto a partir de la auto-reflexión como a través de la interacción con los pares, la información se mantuvo como línea base para repetir las entrevistas después de la finalización del proyecto y así evaluar si las opiniones, las redes sociales, y las perspectivas sobre un problema efectivamente cambiaron como resultado de las intervenciones del proyecto.

Se elaboraron cartas y formatos de consentimiento que se entregaron a cada participante antes de

participar en todas las interacciones celebradas (una para la coordinación del proyecto y otra para cada participante). En las cartas se esbozaban las "reglas de compromiso" para las entrevistas y los talleres, explicando que los participantes eran libres de utilizar la información recibida, pero que no se podía revelar la identidad ni la afiliación de ningún participante. Además, para poder documentar las interacciones sociales y el aprendizaje que tuvo lugar en dichas interacciones, los participantes dieron su consentimiento por escrito para ser fotografiados y grabados en audio y video como parte de su participación en las interacciones. Estas cartas de consentimiento firmadas se guardaron juntas, independientemente de la lista maestra (con códigos para cada entrevistado), o de los datos recogidos, en un archivador en el LANCIS-IE-UNAM durante los tres años que duró el proyecto. Todos los datos se almacenaron en un servidor protegido por contraseña en LANCIS-IE-UNAM, sin identificadores individuales. Asimismo, se mantuvo el anonimato cuando se transcribieron las grabaciones.

Los riesgos para los participantes en este estudio fueron mínimos. Las entrevistas y los talleres representaron un compromiso de tiempo para los participantes, por lo que podrían haber representado una molestia, aunque su participación fue estrictamente voluntaria, y los participantes fueron informados del compromiso de tiempo en cada etapa del proceso para minimizar este riesgo. Ninguno de los datos se consideró de naturaleza sensible.

Ciertos aspectos éticos importantes relacionados con el proceso de investigación-acción estuvieron constantemente presentes y fomentaron las reflexiones entre el equipo de investigación. Por ejemplo, los asociados a los diversos roles cambiantes del equipo de investigación -éramos convocantes, observadores y participantes-. Para mí, que coordiné esta investigación, esto significó reflexionar constantemente sobre cuestiones como: *¿Cómo diseñar e implementar (es decir, intervenir en) un proceso de forma ética? ¿Cómo trazar una línea entre la participación activa y el hecho de apartarse para observar y 'medir'? ¿Cómo permanecer siempre abierta y transparente y no crear falsas expectativas en un proceso que no contempla un resultado claro? ¿Cómo seguir involucrada cuando el financiamiento y el esfuerzo científico 'terminan'?* Otra cuestión persistente fue *¿Qué significa seleccionar individuos para un proceso experimental de este tipo?* Como se indicó anteriormente, se trató de un grupo convocado, no de un grupo preexistente, en el que se seleccionaron determinadas personas en función de criterios específicos para formar un grupo diverso y nuevo. Aunque esto puede haber implicado un "sesgo de selección", era especialmente importante para identificar si las interacciones y actividades diseñadas podían contribuir a posibilitar la agencia colectiva (más allá de aquellas personas predispuestas a tal esfuerzo). La mayoría de los participantes siguieron participando a lo largo del proyecto, lo que sugiere que encontraron valor en la iniciativa. Por lo tanto, este enfoque fue esencial para este experimento social concreto.

> *«Todo cambia y nada permanece. Y no habría belleza, ni danza, ni movimiento si las estaciones no alborotaran los colores y el follaje de los árboles no se desprendiera amarillo en el atardecer».*
> *«El tiempo nos ha vaciado de fulgor, pero la oscuridad sigue poblada de luciérnagas».* Gioconda Belli

> *«La irrealidad de lo mirado da realidad a la mirada».* Octavio Paz

III. Promoting agency for social-ecological transformation: a transformation-lab in the Xochimilco social-ecological system *(Artículo científico de requisito publicado)*

https://www.ecologyandsociety.org/vol23/iss2/art46/

Promoting agency for social-ecological transformation: a transformation-lab in the Xochimilco social-ecological system

Lakshmi Charli-Joseph[1], J. Mario Siqueiros-Garcia[2], Hallie Eakin[3], David Manuel-Navarrete[3] and Rebecca Shelton[3]

ABSTRACT. Experiments to create spaces for social-ecological transformation are multiplying. These experiments aim at transcending traditional spaces for rational deliberation, planning, and participatory decision-making. We present a methodological approach for triggering the emergence of "transformation laboratories" (T-labs), which are participatory spaces where new agency is activated in relation to a stagnant sustainability challenge to generate intentional bottom-up transformations. We applied a set of participatory research tools to elicit current perceptions and foster personal involvement in transforming the ongoing urbanization of a culturally and ecologically significant historical wetland in Mexico City. Given that the emergence of T-labs as genuine bottom-up transformative spaces involves changes at multiple levels (individual, collective, and social-ecological), our approach was designed to promote a safe space that stimulates openness and personal interaction. We posit that through enabling participants to reformulate their connections to the system, to others in the system, and to themselves, the system may be transformed from the inside out. We argue that transformation, in this sense, is essentially about how changes in perception about one's own role in the system's dynamics translate into changes in agency. Our T-lab brought in 19 agents involved in the use and management of the Xochimilco urban wetland. Through a set of research tools, we elicited and presented information that helped agents to see their social-ecological position and role and to identify the practices they share with others within specific social networks and spaces of action. We argue that the process of collaboration initiated by our application of these tools and communication of their results are key for advancing initiatives that seek to create conditions for endogenous transformations.

Key Words: *agency; Mexico; social-ecological systems; sustainability; transformation; transformative space; urbanization; Xochimilco*

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INTRODUCTION

Many parts of the developing world are facing acute social-environmental challenges that have proven resistant to ameliorative interventions and threaten progress toward sustainable development goals (e.g., Leach et al. 2012). The urbanization of sites of significant ecological value, and the social and environmental consequences of such urbanization, is of particular concern. While such urbanization is often a response to an unmet demand for housing, these processes of land transformation can produce risky circumstances for human habitation and erode ecosystem services provisioning. Efforts to halt urbanization or penalize settlements are often unproductive or have fueled social conflict (Moctezuma 2001). These situations, in which ecological pressure is addressed through interventions that ignore socio-cultural components, may result in increased social tension and "trapped" conditions (Eakin et al. 2016, Lade et al. 2017). The individuals in such systems often have multiple identities, roles, and needs: they may simultaneously be land owners, natural resource users (fishers, farmers), members of expanding families in need of housing, community organizers, immigrants seeking work, public officials balancing their actions to achieve both electoral support and rule enforcement, and even environmental activists. Thus, despite both grassroots and formal interventions and policy initiatives to halt urbanization, conflicting incentives, local power dynamics, and diverse needs prevent agents from coalescing around solutions and pathways forward (Barkin 1998, Mohan and Stokke 2000, Maru et al. 2012, Eakin et al. 2016). Given this complexity, many scholars have called for sustainability research and intervention approaches that support a deliberate transformation of the social-ecological system (SES): approaches that focus not on addressing the

exogenous drivers of system change but rather on the internal cognitive and emotional dimensions of human agency, reflexivity, and learning in support of collective action (e.g., Ostrom 2000, 2009, Pahl-Wostl 2002, Diani and McAdam 2003, Pahl-Wostl et al. 2007, Moore and Westley 2011, Westley et al. 2011, 2013, Moore et al. 2014, Manuel-Navarrete and Pelling 2015).

Here, we describe a suite of tools that help elicit a depiction of individual agency and the social and ecological relations in which that agency is constituted and exercised. We posit that using these tools to draw agents' attention to their own agency and how it is embedded within and connected to the agency of others in an SES can be a first step toward motivating collective action. These tools are deployed in the context of an experimental intervention: a "T-lab" designed to foster deliberate change. The concept of transformation laboratories, or T-labs, has emerged as a means through which to provide interactive, participatory innovation spaces that allow for experimentation with new social-ecological-technological system configurations and sustainability pathways (Olsson et al. 2014, Karpouzoglou et al. 2018). Often called laboratories (e.g., transition labs, sustainable food labs, social labs, etc.), these experiments aim at transcending traditional spaces for rational deliberation, participatory decision-making planning, and participatory development (e.g., Van der Walt et al. 2009, Hassan 2014, Heras and Tàbara 2014; Gryszkiewicz et al. *unpublished manuscript,* http://dx.doi.org/10.2139/ssrn.2556692). In our case, the primary objective of the T-lab was to make visible to participants the nature of their own individual and collective agency within the dynamics of the social-ecological system.

For agents (including the research team or facilitators) participating in a T-lab, the nature of the transformation that

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might emerge is initially undefined; the focus is on the contributions of the participants and the tools and approaches that might lead to novelty and collective innovation. Agency and its mobilization is thus a critical ingredient in the T-lab process. Nevertheless, to date there have been relatively few detailed descriptions of the methodology used in support of these experiments. In particular, empirical research is required on how such interventions can foster agency to enhance the potential for novel interventions in sustainability challenges (Tschakert et al. 2016, Abson et al. 2017). Thus, here, we focus on the tool kit we employed in the first stage of our T-lab experiment in an effort to underscore how depicting the agency of individuals is useful for a process in which individual agency is the building block for collective action.

Agency and social-ecological system transformation
Although there is growing agreement on the critical role that agency plays in fostering processes of transformation (e.g., Westley et al. 2011, 2013, Moore et al. 2014, Pesch 2015), there are still empirical, methodological, and theoretical gaps in the criteria and methods that contribute to identifying and promoting agency to enhance the potential for novel interventions in sustainability challenges (Leach et al. 2012, Tschakert et al. 2016, Abson et al. 2017) and the role of supporting agency in the design of transformative spaces (Pereira et al. 2015). Agency is necessary in fostering, promoting, and implementing change (e.g., Bourdieu 1977, Giddens 1984, Emirbayer and Mische 1998, McLaughlin and Dietz 2008, Barandiaran et al. 2009, Westley et al. 2001, 2013, Pesch 2015, Vänninen et al. 2015, Di Paolo et al. 2017, Walker 2018). O'Brien and Sygna (2013), for example, argue that transformation must be conceived of as taking place in three spheres: the personal, the practical, and the political. Within the personal sphere, reflexivity, confronting one's own and collective worldviews, and making values explicit are part of a necessary process of personal transformation. The practical sphere entails people's goals and the strategies and actions they employ to achieve them. The political sphere includes the structures, institutions, and processes beyond the individual that influence system dynamics. As O'Brien and Sygna (2013) point out, although these spheres are interdependent, the interactions among them are rarely sufficiently explored in transformation efforts; agency clearly plays a critical role in such interactions.

Collective agency and action emerges from the beliefs, intentions, perspectives, values, and interactions of unique individuals in interaction, thus highlighting the importance of understanding individual agency. An agent is an individual that embodies a set of socially shared beliefs, values, and norms that justify and motivate its actions. SES dynamics are contingent on human agents' intentions toward the system, which include deliberate efforts to maintain or alter the system's emergent structures and identity (Manuel-Navarrete 2015). Thus, placing human agency at the center of social-ecological transformations highlights the intrinsic involvement of humans in emergent dynamics of SESs and the transformations of such structures.

It is a common activity in social-ecological research to request that agents depict the dynamics of the SES in which they are embedded and imagine, abstractly, how and what might influence those dynamics. It is less common to employ methods that embed agents within a system, illustrating how their existing individual and collective intentions, roles, and actions interact with their surroundings to influence ecological processes and social relations. Nevertheless, it is the collection of individuals and their interactions in a particular social-ecological domain that shape (but do not determine) the potential scope of transformation. From our perspective, agency is not given to the individual but is developed over the course of a lifetime in which the process of becoming an agent is achieved in a dynamic and coupled interaction with the social-ecological and cultural environment (Laland and O'Brien 2011). Thus, agency is emergent from a process of mutual transformation among the individual and its environment, within social networks, and with culture. This understanding of agency assumes that an agent is always a situated individual within some defined context and that this context shapes and is shaped by the individual through its practices and interactions.

A common mistake in participatory development interventions is to assume the existence of strong collective agency in local communities (Williams 2004). Participatory processes have long been critiqued in the development literature for being instruments of the utilitarian and technocratic goals of hegemonic agents or the state, rather than processes that empower participants as political agents of destinies of their own choosing (Williams 2004). The assumption that change must emerge from decentralized, local initiatives dependent on the existence of significant agency is problematic: not only are local contexts subject to politics, co-option, and competition (Williams 2004), but also the "wicked" problems that characterize most sustainability challenges feature political forces and economic interests as well as institutions that are instrumental in maintaining individuals in marginal conditions (Wood 2003).

Kothari (2001) criticizes participatory development programs as processes that further marginalize individuals and groups by instrumentalizing process outcomes for a prepackaged "development process" that they neither conceived of nor consented to. In our own fieldwork experience in Mexico and elsewhere, we have encountered local communities that are "burnt out" by disappointing "participatory" processes that delivered neither real participation nor empowerment. T-labs seek to address this cynicism directed toward the participatory process by shifting the goal of intervention explicitly from "participating in development" to enabling "collective action" and coordination. This shift is consistent with calls for interventions that open up new spaces for political action through building "political capabilities" (Williams 2004; Whitehead and Gray-Molina, *unpublished manuscript,* http://siteresources.worldbank.org/ INTPOVERTY/Resources/WDR/DfiD-Project-Papers/whitehea. pdf). However, T-lab interventions go beyond the political by positing that collective and individual capacities are developed through the cultivation of aware social-ecological agents (Manuel-Navarrete and Buzinde 2010). Thus, interventions are not just focused on bestowing the poor with capacity to partake in participatory arenas and processes set up or condoned by the state, but rather on cultivating capacities as social-ecological subjects, to shape (and transform) the SES of which they are already a part (Manuel-Navarrete and Pelling 2015). Aware of this challenge, our aim in the T-lab was to identify those agents who would be willing to engage in a series of social interactions, i.e., getting together with the research team and other individuals interested in social-ecological change, without knowing the endpoint of the process.

The problem space
We apply our approach to depicting agency within the context of a specific wicked problem: the nexus of urbanization, wetland conservation, and livelihood sustainability in Xochimilco, Mexico City. The Xochimilco urban wetland ecosystem has been in a process of degradation for several decades and is currently highly contaminated from urban waste and agricultural activities and is overexploited by tourism (Mazari-Hiriart et al. 2008, Zambrano et al. 2009). The wetland is the last remnant of the pre-Hispanic wetlands and agricultural system composed of *chinampas,* a type of Mesoamerican agriculture consisting of rectangular raised fields to grow crops on a shallow lake, which once formed the basis of Mexico City's agricultural development.

Today, there are fewer and fewer farmers (*chinamperos*) who want to farm the *chinampas,* and thus, there is a strong incentive to urbanize the land. Urbanization, however, leads to structures that are subject to flooding and subsidence, and the lack of sewage infrastructure results in the discharge of wastewater directly into the wetland. The city government recognizes the ecological and recreational value of the wetland and has worked to attract international attention and support for its conservation. However, ineffective policies, inadequate resources, and corruption have undermined formal efforts (e.g., Wigle 2010, 2014). Both urban and agricultural residents resent the city's efforts to impose ecological regulations, whereas some environmental groups view local residents as complicit in degradation through farming practices and illegal urban construction. Other local inhabitants (some farmers, some descendants of *chinamperos,* some immigrants seeking housing, and some fishermen) perceive diverse causes of degradation, including urbanization, pollution, lack of interest of landowners, and lack of enforcement by officials. As a result of a diversity of conflicting incentives, agendas, and trends, some local activists have articulated that the system is trapped: there is little consensus or trusted leadership and few clear policy alternatives that would alter what many have concluded are undesirable social-ecological dynamics.

It was from within this context that we engaged local residents in the process of a T-lab with the aim of exploring alternative, though not yet identified, pathways toward social-ecological transformation. Rather than focusing on external "solutions," although these may emerge in the process of the T-lab, we focus on what individuals working together can do to accomplish their goals by making visible who is doing what, with whom, where, and why, and how participants in the T-lab think these relationships can or should change if specific outcomes are desired or attributes of values are to be preserved. In other words, we aimed to help participants (including ourselves) identify and mobilize their capabilities, roles, and responsibilities in relation to the wetland's past, present, and future.

The T-lab in Xochimilco is ongoing. Designed as a two-year process (with the potential to continue, according to the motivation and interests of the participants), the T-lab aims to be an emergent space for reflection, reframing, and the formation of new pathways for change. Phase 1 of the T-lab process was designed to accomplish the following goals: (1) make visible the manifestation of individual participants' agency in the SES by using tools that position them in the system in terms of their social relations and networks, regular activities, goals, and values within

the system (i.e., the space of action); (2) develop tools that allow different individuals to describe how they perceive the system in which they are embedded; and (3) work with the participants to help them identify where they feel they have agency in the system, over what elements, and through what networks. Through achieving these goals, we aimed to depict the elements that illustrate the profile of each individual's sense of agency and what we call the space of action of each individual.

This phase is followed by a series of social interactions, or *encuentros,* which are meetings of the individuals who participated in phase 1 of the process, as well as the implementation of a series of activities designed to foster new insights into the SES's dynamics, the role of the participants in those dynamics, and collective pathways forward. This phase is ongoing and will not be described here.

We next describe the methods we designed and implemented to select the participants for the T-lab and elicit elements of their individual agency. In addition, we present how we visually represented these elicited elements to enhance the understanding of one's own agency and its relationship to others' agency. We then explain the results of applying these methods in the case of Xochimilco and conclude with a discussion of how these tools were received by the participants in the T-lab and what we learned from the process about mobilizing agency for sustainability transformations.

APPROACH AND METHODS

Criteria for involving participants
We recruited participants for the project by relying on key informants who had participated in former research projects in the area and on snowball sampling methods. To help identify which personal characteristics might be relevant to the process, we began with criteria on leadership and "change agents" defined within the existing sustainability literature, primarily informed by Westley et al. (2013). We modified these criteria to acknowledge the local context. In our case, we aimed for a group of participants that collectively had: (1) diverse types of knowledge about the area; (2) actionable social networks, e.g., through previous capacity-building projects, organized collective work, institutional affiliations, etc.; (3) capacity and willingness to experiment with different approaches; (4) determination and will to both conserve social-ecological attributes of the system and change the current hindering conditions; (5) some sense of attachment to the place, i.e., Xochimilco wetland; (6) experience in alternative activities, e.g. organic farming, ecotourism, ecotechnologies; (7) solidarity and empathy with respect to other group members; and (8) experience working on problems of community development and grassroots innovation.

The composition of the sample of 19 interviewees is as follows. Nine participants were from civil society: five of these were local agricultural producers from different areas and types of production, two worked in capacity-building projects in the area (tightly linked to academia), one worked in irregular settlements activism, and one was an artist. Four participants were governmental agents from the city and federal level, working in the areas of urbanization, wetland conservation and climate change, environmental enforcement and compliance, and city resilience initiatives. Three participants were academics, all

working in the area around issues of water quality, conservation, and sustainable production schemes. Three participants were from nongovernmental organizations: one worked in rainwater harvesting techniques, one was from a local nongovernmental organization that promotes sustainable agricultural practices, and one worked in sustainable urban projects. The group was composed of participants that could act at different levels of action, i.e., from local (*chinamperos*) to global projects (i.e., the 100 Resililent Cities) and from within the boundaries of the wetland system and beyond its boundaries. The array of participants also included a variety of agents that covered diverse arenas of action such as political and academic.

We determined that two types of participants were needed for different roles in the project. First, agents with potential to support alliance building are crucial for affecting system change (Dorado 2005, Westley et al. 2013). These agents were identified by their sector of work, institutional affiliation, attribution, and diverse experience and knowledge (e.g., certain senior academics, policy makers from the federal government). This group acts as informants for the process, rather than being involved during the collective interactions (i.e., in phase 2). In some sense, they can be thought of as companions that accompany and support the core group initiatives. The second set of agents were invited to be more directly involved in the collaborative process and thus were selected based primarily on the criteria for and qualities of change agents. This group of individuals comprises both "outsiders" (e.g., individuals with experience working on problems of community development and grassroots innovation but not necessarily addressing the main issues in the area) and "insiders" (e.g., individuals who work and live in the area). Thus, these participants would be those who we anticipated would eventually participate in the collaborative processes we are designing to engender SES transformation.

Agents' profiles and baseline
Once potential participants were identified, we created a comprehensive profile for each one of them to capture elements of the individual's agency and present those elements back to the participant and to others. In relation to the broader T-lab process, the elements of individual agency that were captured during this initial interview were recorded as a baseline from which we could assess any changes in an individual's self-described agency. These profiles could also serve as points of reference from which collective agency could emerge: We expected to see elements of individual attributes and capacities being mobilized in collective action, and the participants to incorporate each other into their action networks through the T-lab process.

The individual profiles are composed of three main elements: a stakeholder network map (other individuals with whom a person works within the area, and the practices that connect them), a participant's perception of the system and her or his place in it, and a preliminary indication of the individual's value system. We designed specific methods for each element, as follows, and implemented them through semistructured individual interviews.

The social action arena
We used two techniques to help the interviewees identify the social and ecological space in which they were embedded within the broader SES (the social action arena). These techniques elicited the agent's social network, which, for this purpose, included the

people with whom they were collaborating most frequently ("ego-nets") and the practices that characterized these collaborations ("action-nets"). The ego-nets and action-nets together depict what we call the social action arena, which depicts the interviewee's social capital and role in system dynamics. The interviewees' ego-nets (Crossley et al. 2015) are illustrated with three dimensions: alters composition, distance, and influence and nature of relation (Fig. 1; for details, see https://github.com/sostenibilidad-unam/tlabs/blob/master/ANA.md).

Fig. 1. Example of an ego-net.
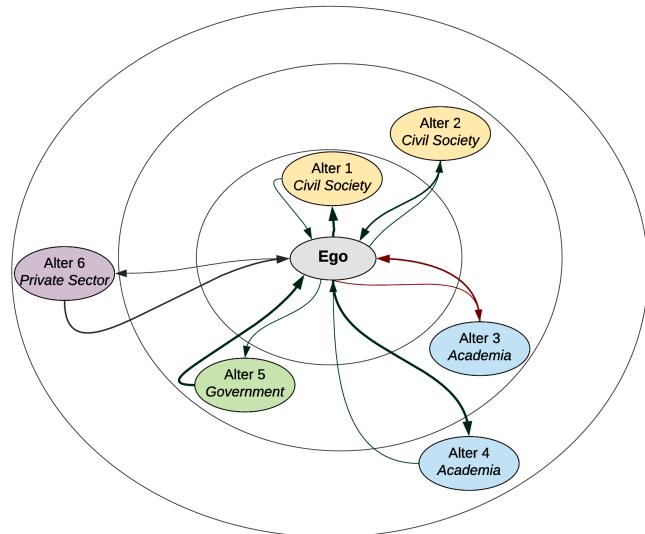
The action-net (developed by the first and second authors) is a general bipartite or two-mode directed network that is composed of two kinds of nodes: alters and practices. This network presents the alters (the same as represented in the ego-net), linked by practices, e.g., those activities through which an ego interacts with one or more alter (Fig. 2).

Depiction of agents' problem space
We used cognitive mapping-based techniques to elicit how the interviewee perceives the problems confronting the SES in which he or she is embedded in terms of the causal relationships of elements and variables that shape the system. The output of this process is an individual baseline cognitive map from which changes in perception and problem framing can be evaluated as the T-lab progresses. In our case, for example, we used cognitive maps to identify how agents perceived and conceptualized the problem of urbanization and wetland degradation in Xochimilco prior to the next phases of the T-lab interventions.

The first step was to assemble a set of core variables that we gathered from preliminary semistructured interviews with key informants, as well as from the literature review. These variables were categorized into two types: state and process variables (Table 1, Fig. 3). The core set of predefined variables represents crucial causal relationships in the Xochimilco wetland system and allowed us to compare the different cognitive maps; however, if the interviewee required it, new variables could be added to the cognitive map (for details see https://github.com/sostenibilidad-unam/tlabs/blob/master/ANA.md).

Fig. 2. Examples of action-nets for alters (A) and practices (B).

*2a. Alters (by Outdegree)*   *2b. Practices (by Indegree)*
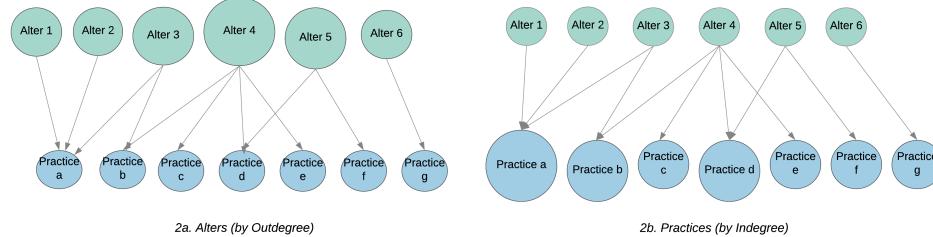
Table 1. List of predefined state and process variables.

State variables	Process variables
Water pollution	Human migration (immigration and emigration)
Water scarcity	Population growth
Land subsidence	*Chinampas* abandonment
Overexploitation of water resources	*Chinampas* urbanization (due to land use change)
Human health problems	Wastewater discharge
Irregular settlements	Solid waste disposal
Regular settlements	Loss of biodiversity
Inequality (due to lack of access and work opportunities)	Intensive agricultural activities (greenhouses, pesticides)
Lack of infrastructure and urban services	Loss of soil quality
Lack of participation from civil society	
Lack of institutional coordination	
Lack of public policy implementation	
Young generations do not work in agriculture	
Loss of cultural values	
Lack of markets	
Lack of regulation of touristic activities	
Inappropriate livestock practices	

Based on the connectivity degree of the variables as well as their position in the network, we made a qualitative classification of the participants into different groups by identifying the topics of the variables in the cognitive maps. When looking at these properties, it is possible to infer a participant's understanding of the Xochimilco SES and its degradation. Thus, we defined five categories to represent the general focus of their system interpretation: agro-ecological/water, cultural, urban, governance, and urban governance. Although two or more residents may be categorized in the same group, they may have distinct (although associated) narratives on the same topic. The classification of interviewees by their primary focus of concern around the system is informative about the differences in problem framings. Interestingly, interviewees might coincide in the same focus of concern but differ in their cognitive map relevant variables. Finally, we combined all the individual cognitive maps to explore whether we could define meta-narratives among the interviewees, for example, connections among system elements that were repeated by two or more participants.

Fig. 3. Example of a cognitive map.

○ *State variables*

● *Process variables*
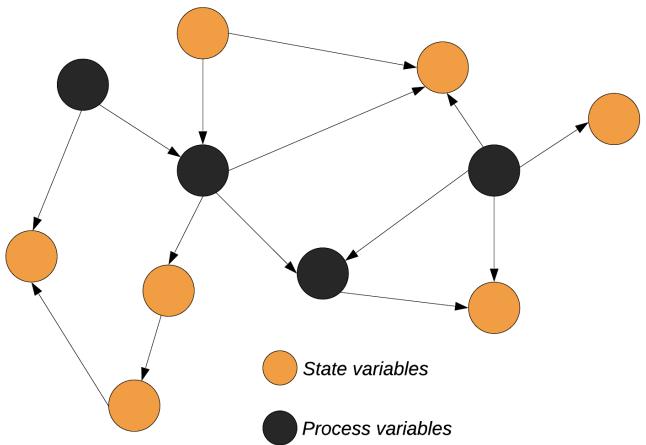
Together, stakeholder network mapping and cognitive maps comprise a methodology for depicting individual agency that we refer to as agency network analysis (ANA). Our goal is for ANA to provide a series of outputs ("maps") for participants to use as learning and reflection tools regarding how their activities and roles relate to and influence the SES. In this sense, ANA is a building block for deliberate transformation of an SES. In particular, ANA was designed to map the interviewee's social action arena in the context of the problem space as perceived by the interviewee. This is accomplished by situating the relative position and importance (centrality, betweenness-centrality, and clustering coefficient) of the alters (collaborators) to the ego (the interviewee). Critically, this method is designed to ensure that the interviewees situate themselves as agents with influence within the system, rather than as external observers. Thus, the method requests that the interviewees identify where (in relation to which variables in the cognitive map) they see their current capacity for intervention in the problem situation (e.g., in relation to which other agents, and over which system variables), with the expectation that this will empower them to act. Furthermore, ANA was also designed to facilitate self-reflection by enabling participants to describe distinct narratives about their connection to the SES, for example, in relation to other agents (ego-alters), among and across the network (alter-alter), and in relation to practices and the elements of the SES (practices-world). Such narratives refer to system elements that are represented both in the stakeholder network mapping process and in crucial elements

of the system that the interviewee depicted through cognitive mapping. The structure of narratives is of the sort: "I, working with x and y, doing z, act on a,b,c variables of the system."

Agents' value system
To identify how each interviewee values different attributes of the SES and thus normatively frames his or her issues of concern in relation to the SES, we used Q methodology (e.g., Brown 1986, Webler et al. 2009, Zabala 2014). The objective of this activity was to explore with the interviewee how his or her activities, social interactions, and depiction of the problem situation in the SES were related to the elements and attributes of the SES that the participant valued most. We assume that the actions of any agent are in part guided by those issues that the agent perceives as relevant and valuable (Stern and Dietz 1994). In our case, we assessed how different participants perceive the role of specific meaningful attributes in key activities that take place in the wetland (around issues of conservation, degradation, urbanization, rights to land and water, among others).

Q methodology entails having the interviewee sort normative statements about a topic. For our case, a total of 15 T-lab participants were asked to sort 28 statements, ranging from statements that they most agree with (value +4) to statements that they most disagree with (value −4). The statements were extracted from previous interviews in the area and from the literature. Such statements (called Q statements) relate to four main categories: land use and property rights (four statements); patrimony, identity, and values (12 statements); ecological conditions and stressors (eight statements); and livelihoods (four statements).

All participants' sorts of statements (Q sorts) were statistically analyzed using the *Q methodology* package for R. This software package uses principal component analysis to find how individuals are correlated to one another based on their agreement or disagreement on particular sets of statements (Webler 2009, Zabala 2014; for details see https://github.com/sostenibilidad-unam/tlabs/tree/master/qmethodology).

We obtained complete ego-nets, action-nets, and cognitive maps from 17 of the 19 individuals we interviewed, and we performed the Q methodology with 15 interviewees. Overall, we obtained 12 interviews with a complete set of maps and results from applying the Q method. For this reason, the analysis for the integrated instruments (ANA plus Q methodology) considered these 12 interviewees. We derived visual representations of each participant's networks and practices in the problem space that they defined through the approach described above.

Together, the stakeholder network mapping, the elicitation of individual cognitive maps of the SES, and the application of Q methodology provide a profile of the interviewee's agency and can be used as a baseline from which to evaluate change as the interviewee interacts with other participants in the T-lab in later stages of the process. In Fig. 4, we illustrate how the three different instruments are articulated to identify the conceptual elements of individual agency.

RESULTS
The results from the interviews showed that participants were different in terms of their background, sector of work, and their particular attachment to the Xochimilco SES. ANA and Q methodology showed that participants depicted themselves as

attached to the area and as risk takers and innovators. They were also perceived by others as honest and trustworthy. We shared the results from our analysis of each interviewee's capacities, networks, and thus, current agency, to the respective interviewee directly, but otherwise, we kept the analyses confidential.

Fig. 4. Flowchart showing how individual agency is identified.
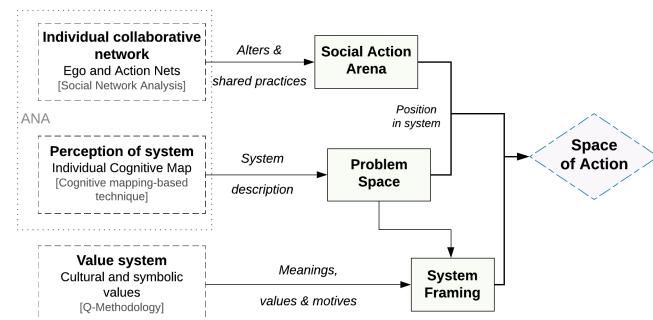
The social action arena
The results of ego-nets and action nets enabled us to visualize graphically the differences and similarities across interviewees, not only in terms of the number or diversity of collaborators (alters), but also via the practices they perform with them. The number of alters associated with each interviewee ranged from 4 to 30. Some interviewees only reported one kind of collaborator (e.g., civil society, academia, etc.), whereas others had a varied spectrum of collaborators, and the interviewees also reported collaborations with alters working at different scales (i.e., local, regional, federal, or international). The number of collaborators that belong to civil society was significantly higher compared to that of academia and government. The least represented areas of collaborators were those from private initiative and for-profit organizations (Fig. 5).

Fig. 5. Number of collaborators (alters) per sector of work.
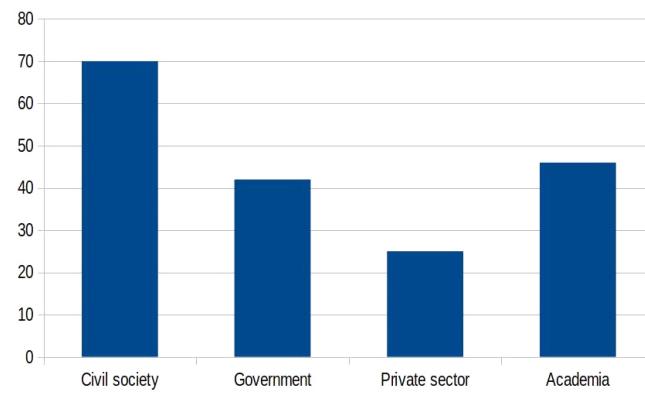
Egos and alters were engaged in 216 practices grouped into 20 categories of activities (see https://github.com/sostenibilidad-unam/tlabs/blob/master/data/practices.csv for the complete list of activities). Eight of these categories received the majority of collaborative efforts (i.e., practices in which > 10 alters are involved). Moreover, only eight alters participated in 16 categories

Fig. 6. Network of categories of practices (brown) and alters (blue). Triangles indicate categories of practices in which there is high participation of alters.
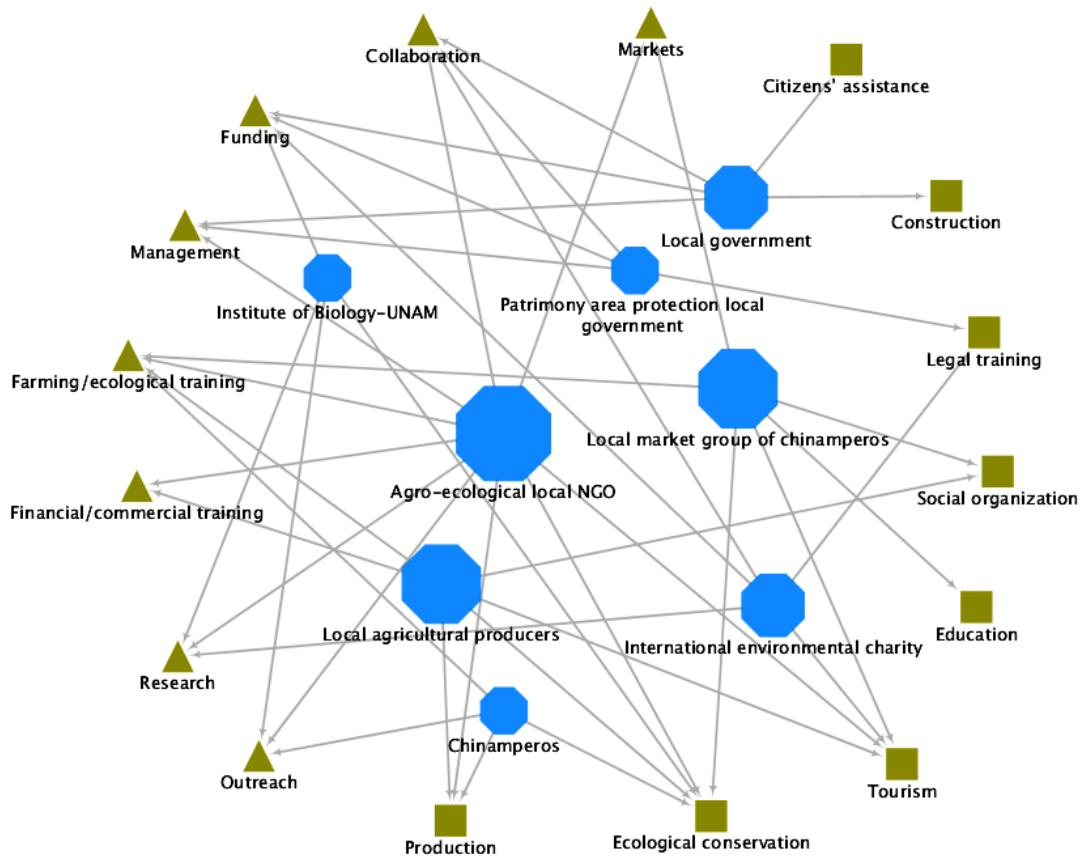
of practices (including the eight mentioned previously; Fig. 6). These alters are the ones with the widest diversity of activity engagement.

Agents' problem space
Our analysis of cognitive maps revealed which system elements and connections were shared with other interviewees and which elements were particular to each interviewee's description of the SES. Those aspects of the cognitive map that are unique to specific interviewees are particularly illustrative of their interpretation of the system. We used the specific articulation of variables and their prominence according to their position in the cognitive map to identify the participant with a narrative of the system. For example, interviewees TL004 and TL007 were categorized with "urbanization"; however, TL004 conceptualized the degradation of Xochimilco as a problem of uncontrolled population growth, lack of job opportunities, water scarcity, and lack of citizen actions that impact and lead to public health issues and the abandonment of *chinampas*. In contrast, TL007 conceptualized the problem as one of immigration to the area, *chinampas* urbanization, and water pollution, and these factors as having an impact on the quality of the soil and on the abandonment of *chinampas*. The cognitive map analysis thus permitted an exploration of how interviewees conceptualized the system

differently, and how these differences relate to their individual agent profiles.

We identified two common meta-narratives related to the degradation of Xochimilco. These two meta-narratives revealed that although the perception of degradation was prevalent among the individual interviewees, degradation is not limited to its ecological expression, but includes social and cultural degradation as well.

We characterized the first and most complex meta-narrative in terms of its variables, which we called "urbanization" (or Urban). According to the elements connected in the meta-narrative, the notion of urbanization involved several central processes such as population growth, farmers' abandonment of *chinampas,* and urbanization of *chinampas.* These processes affect each other in a way in which farmers' abandonment of *chinampas* creates conditions for the *chinampas* to be urbanized by new settlers searching for new land because of the imbalanced ratio of population growth and decreased space for building houses. In the view of the participants, these three central processes create a particular context that is further influenced by other concepts such as the loss of Xochimilco's traditional cultural values and its subsequent effect on the younger generations' lack of interest in farming. These latter relationships in the narrative are

Table 2. Four perspectives that emerged from the Q method factor analysis as determined by statistical analysis of interviewees statement alignment.

Factor and interviewee number	Value	Statements that distinguish each factor	Statement category
Factor 1	+4	2. *Chinampas* land use should be exclusively for agriculture	Land use and property rights
Interviewee: 001, 002, 007, 009, 010, 016, 018, 019	0	25. People who are not native to Xochimilco are problematic because they do not know anything about it or do not care	Patrimony, identity, and values
Factor 2	+4	4. The *chinampa* represents the patrimony of all Mexicans	Patrimony, identity, and values
Interviewee: 006, 008, 015	+2	10. Xochimilco festivities should be preserved, as they are part of Mexico's history	Patrimony, identity, and values
	−1	12. Xochimilco as a priority site for biodiversity conservation is overrated	Patrimony, identity, and values
Factor 3	0	6. The *chinampa* is an important element of Xochimilco identity	Patrimony, identity, and values
Interviewee: 004, 014, 017	0	17. It is possible to convert *chinampas* land use to urban without degrading Xochimilco lake	Land use and property rights
	+3	18. Agricultural use of the *chinampas* is affecting the ecology of Xochimilco lake	Ecological conditions and stressors
	+3	23. It is important to bless the *chinampas* and their agricultural products	Patrimony, identity, and values
Factor 4	+1	16. Lots of young people aspire to continue the traditional agricultural practices in the *chinampas*	Livelihoods
Interviewee: 005	+2	19. The lake area of Xochimilco is in good ecological condition	Ecological conditions and stressors

particularly important because Xochimilco's identity, formed by tens of generations, has been grounded in farming. Related to the lack of interest in farming is the issue of reduced market opportunities for farm commodities. Regulated and unregulated settlements on the *chinampas* also play an important role in the urbanization meta-narrative. In this meta-narrative, it is clear that the interviewees understood that there is a positive feedback between new settlements on the *chinampas* (that, when first established, are unregulated) and farmers' abandonment of *chinampas.* This is not a minor issue because *chinampas* are part of the protected and conservation area. Finally, it was understood that the lack of action and absence of interest shown by both local government and civil society plays a role in the current situation. In summary, this urbanization narrative comprised three elements: (1) the loss of cultural values and farmers' identity of Xochimilco, (2) uncontrolled urban growth and the change in land use from farming to unregulated human settlements, and (3) lack of governance (from local government and civil society).

In the second meta-narrative, we identified that there was a relationship between "intensive farming practices" (or Agro) and the quality of soil and water. The meta-narrative demonstrated that the interviewees understood that intensive farming, especially when pesticides are used, has considerable impact on soil and water quality, biodiversity loss, and human health. Soil, water, biodiversity loss, and public health problems were not only attributed to intensive farming but, inevitably, were also linked to urbanization and land use changes.

In summary, the Urban and Agro meta-narratives were connected through issues of water, particularly through the concepts of water pollution, sewage discharge, and overexploitation of water bodies. Implicitly, the agency of the interviewees is reflected in these meta-narratives through the activities of farming, market engagement, tourism, and urbanization. Making these connections explicit implies that the interviewees' roles, responsibilities, values, and actions in shaping the SES's dynamics are made visible.

Integrating agency network analysis
The results from ANA were mapped into a single graph as a "hiveplot" (Fig. 7). The hiveplot shows the articulation of the ego-nets, action-nets, categories of practices, and meta-narratives. It allowed us to identify the most prominent alters in terms of their relation to both egos and practices, and most importantly, which categories of practices received the most collaborative efforts. When observing these categories in terms of the two meta-narratives that emerged from the cognitive maps, we see that the categories of practices devoted to the area of Agro are double the number of categories of practices that correspond to the Urban meta-narrative.

Agents' values systems
The Q methodology analysis was performed with 15 participants (Q sorts), using 28 statements. The perspectives of the participants were represented by four factors (clusters of a "shared" vision). Certain statements distinguish each factor because they have statistically significant differences when factors are compared (Table 2). In general terms, the four perspectives that emerged from this analysis are: factor 1, *chinampas* for exclusive agricultural use; factor 2, *chinampas* as a Mexican crucial patrimony; factor 3, current agricultural practices affect the ecological condition of the wetland, and religious beliefs are important for *chinampas* agriculture; and factor 4, the wetland is in a good ecological condition, and young people still aspire to continue the agricultural *chinampa* practices. However, because factor 4 has only one participant, the statements that distinguish that factor from the others are not the statements with higher values; thus, this participant most agrees (+4) with the statement, "All inhabitants and visitors of Xochimilco must keep the area clean," and most disagrees (−4) with, "It is possible to convert the land use of *chinampas* to urban without degrading the Xochimilco lake."

The analysis also provided information regarding which of the normative statements received the greatest consensus among interviewees and thus indicated where there appears to be

Fig. 7. Articulation of ego and action networks with the meta-narratives from cognitive maps. Egos and alters axes: yellow = civil society, blue = academia, green = government, purple = private sector. Practices axis: practices are clustered by category and ordered by in-degree; squares = Urban meta-narrative, circles = Agro meta-narrative, superimposed squares and circles = both Urban and Agro.
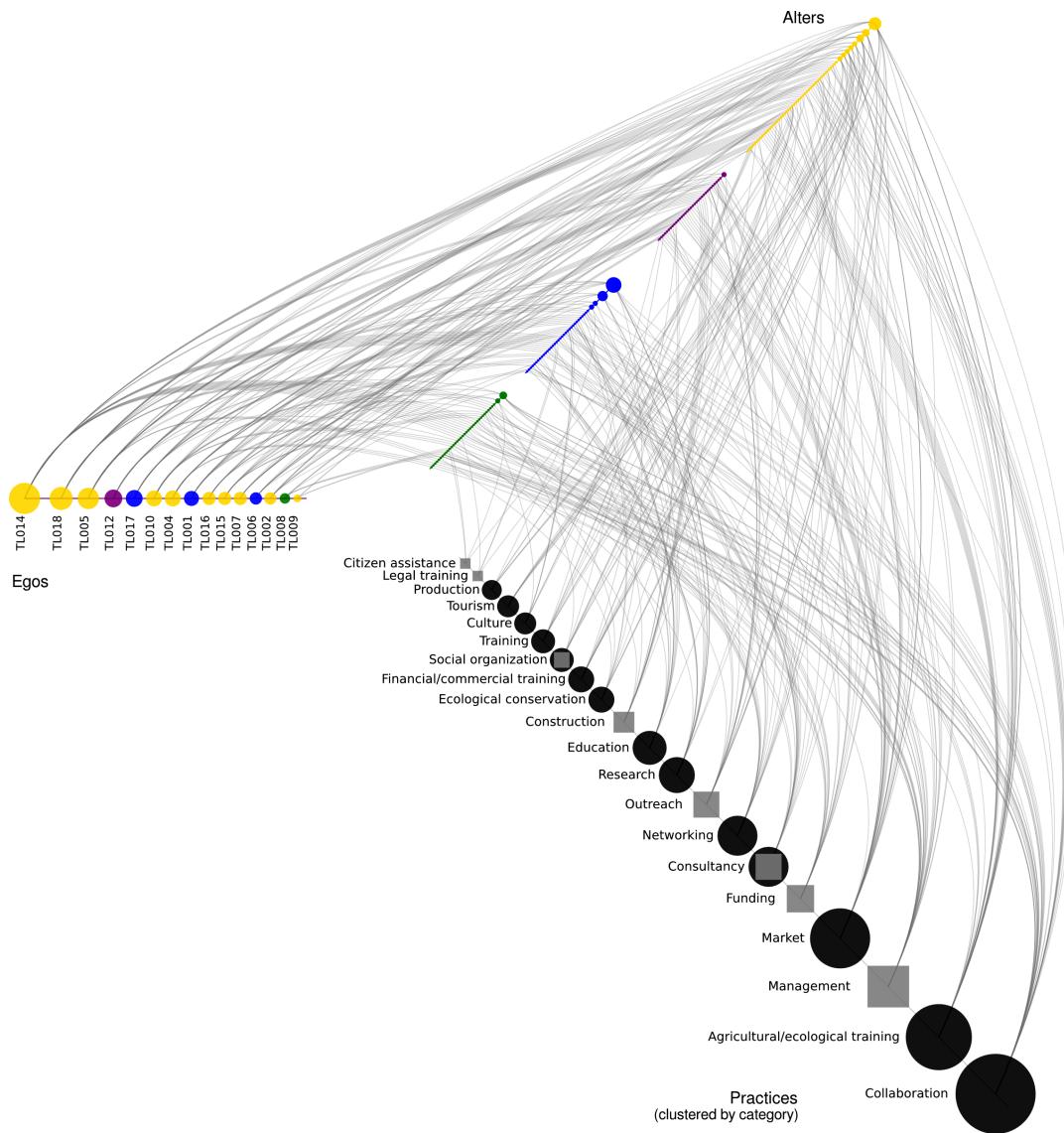
common ground or widely shared perspectives among those interviewed. In our case, the statement most frequently chosen by participants to be given a value of +4 was, "Urbanization is destroying Xochimilco," and the one chosen most frequently with a value of −4 was, "The lake area of Xochimilco is in a good ecological condition."

The following example illustrates how the information extracted with the different instruments forms the profile of an agent. Interviewee TL001 is an agent who has worked mainly in two different worlds (academic and nongovernmental) by developing capacity-building projects in water quality analysis for *chinamperos.* The social network analysis showed that this agent's social action arena consists of social capital that mainly revolves

around these types of practices (practices through which the ego connects academia with civil society), a role that has the potential to act as a strong link between these groups as an intermediary for communication and as a monitor of the SES. The narrative derived from the agent's cognitive map falls within the category of Agro-ecological/water, and the agent located itself acting on issues related to agricultural practices but would like to work in urbanization topics (and found urbanization as one of the most crucial problems in the system). Furthermore, interviewee TL001 belongs to a group (factor 1 in the Q methodology) in which issues of concerns are the ones that matter the most to local inhabitants and *chinamperos,* particularly issues about biodiversity, urbanization, degradation of the ecosystem, and the *chinampa* as a core element of the Xochimilco system.

DISCUSSION

Here, we have described a suite of tools and approaches to elucidate agency in terms of personal and shared perspectives, values, and practices, and common narratives relating the individual to the social and political processes that drive system dynamics. Although some of the methodological tools we used are not new, our intention was to employ and articulate them in a novel way to capture the different facets of potentially transformative agents. The approach we have described here was designed: (1) to identify and describe the types of potential agents of change in a specific context and system, (2) to identify the different visions of a system from the agents' perspectives, (3) to identify the space of action of the agents and the redundancy or gaps in their action routes, and (4) to develop both a baseline from which potential change can be observed and an input for the design of a transformative space intended to generate collective agency. Ultimately, our aim was to depict the place of the individual within processes of broader system transformation.

As part of the mixed set of methods, we found that ANA was useful in identifying interviewees' space of action, their resources, and social relationships that the interviewee draws on to act in these spaces. In other words, ANA was instrumental in describing how and where each agent is acting within the system. Coupling ANA with Q methodology provided a more detailed understanding of the profile of each agent because it elicited the main motivations behind the agents' actions (i.e., whether to act in a certain way but not in another) in the space of action. Thus, we were not only capturing what people were doing, where, and with whom, but were also getting some insights into why, or in the case of actions that did not correspond to the values expressed by the interviewee, where disjuncture exists that requires further exploration with the interviewee as a potential topic for reflection and learning. We consider this combined method to provide a fair but concise description of the participant as an agent in its context. Furthermore, ANA plus Q methodology helped us to ensure that participants in the T-lab had different capacities and social networks related to Xochimilco. By bringing diverse and potentially complementary skills and connections to the T-lab, we hope to create conditions in which novel interactions might evolve as the project continues.

Although most of the interviewees (egos) have similarities in their social networks with respect to sharing collaborators (alters), when articulating the results of ANA, we identified a low degree of collaboration among the participants we interviewed because few of the practices they reported were shared with more than one collaborator, even though they reported engaging in similar types of practices. Furthermore, when analyzing the meta-narratives that emerged from the cognitive maps, it was clear that the system variables the interviewees perceived as the most important (i.e., urban issues) often did not match the most common practices in which they were engaging (i.e., agricultural). These results suggest that there is redundancy among the networks because agents might be "trapped" in the same loop of action. This analysis thus gave us information in support of our hypothesis: although several agents are engaged in similar practices within the area, the collaboration among them is not sufficient to affect the issues they perceive as most urgent according to their cognitive maps and Q sorts.

Responding to the many concerns expressed in participatory development literature (e.g., Kothari 2001, Williams 2004; Whitehead and Gray-Molina, *unpublished manuscript*, http://siteresources.worldbank.org/INTPOVERTY/Resources/WDR/DfiD-Project-Papers/whitehea.pdf), we also found that this approach allowed us to capture multiple ego-centric (interviewee-centric) viewpoints on a system prior to engaging in any collective process that might unintentionally exacerbate or reproduce existing social power dynamics or silence particular voices. To create the imagined possibilities of emancipatory spaces and processes and the potential for political agency and change, there is a need to engage with individuals and their aspirations and values (Brown and Westaway 2011, Walker 2018). Our approach provided a sort of "boundary object," i.e., a series of maps, that reflected, albeit abstractly, the interviewees' social and ecological reality in a novel way. By capturing each interviewee's world and worldview independently, we aimed to ensure that all voices we engaged with were represented fully and as accurately as possible. The actions, beliefs, and capacities of some individuals would have inevitably remained hidden to us, and perhaps to themselves, if they had simply engaged in a collective process without having had the opportunity to reflect on their individual agency. Second, if, as the literature increasingly recognizes (O'Brien 2012, O'Brien and Sygna 2013, Pelling et al. 2015), system transformation must have roots in cognitive and psychological change, the approach of transformative design must engage the personal and explicitly link personal profiles to the SES. Thus, participants' information, as agents, is the foundation for creating a cognitively and emotionally meaningful space (Colombetti and Krueger 2015). Thus, for a group of individuals to develop collective agency, they must first understand and materialize their own individual agency in the system in which they are embedded (O'Brien and Sygna 2013, Pesch 2015).

The ultimate objective of our transformative space is to create conditions from which collective agency can emerge. From our perspective, a transformative space is first a safe space, which, according to Pereira et al. (2015:6035, 6038), is a collaborative milieu in which to "[...] freely express different views, opinions and beliefs," while "[...] recognising the opportunities associated with pluralising knowledge systems as a stepping stone towards enacting SETs (social-ecological transformations)," and it is "[..] fundamentally not only about the deliberation and enactment of 'sustainable' transformations, but also equally about 'just' transformations based on greater community understanding, equality and justice." Under this conceptual umbrella, the aim of our transformative space would be to create a process through which we could achieve construction of meaningful social relationships through the emergence of shared values, problem reframing and reflexivity, and discovery of different (new) pathways for change.

The initial phase of the T-lab provides a foundation for these objectives. The construction of meaningful social relationships through the emergence of shared values can be promoted by using Q methodology. The Q method illustrates where there is convergence in values among disparate individuals, even prior to any social interaction. It also illustrates where perspectives and values may be most divergent. Furthermore, the results from the cognitive maps provide inputs that can be used in later stages of the T-lab to help design activities to promote empathy, an essential

component of collective agency (e.g., Groch et al. 2012, Wald et al. 2017). The cognitive maps illustrate how individuals are positioned within a suite of particular system interactions and dynamics; these insights can be used as entry points to see the same system from points of view of other agents.

Collective problem reframing, which is also an ambition of many exercises for transformative change, is also facilitated by the methods described here. Cognitive maps and Q methodology offer a baseline that define the starting point from which initial visions can be explored and reframed through activities that foster reflexivity. In later stages of the T-lab process, different participants have invited each other to "enter their world" so that they can have a direct experience of the conditions in which they live and act, for example, farming the *chinampa* or living in an informal settlement at the edge of the wetland. These experiences, embodying the cognitive maps and Q sorts of the interviewees, serve to bring new agents into the personal worlds of each interviewee, can potentially help to change preconceived ideas about what the problems are, and can also help participants to think differently about how others experience and conceptualize their relationships with the environment.

Discovering new pathways for change is, perhaps, the most aspirational but also most essential outcome of any deliberative transformative process. In this initial phase of the T-lab, we aimed to help individuals link what they do in the system to what they value and what they perceive as the most problematic about the system in which they act. Because the ego and action networks illustrate capacities of individuals and link these capacities to practices and to other people (alters), these networks illustrate existing pathways in which individuals are engaged. Collectively, the number, type, and scale of influence of the alters associated with the interviewees provides the basis for speculation on the possible pathways and networks through which change could occur and how agency could grow in conjunction with the T-lab process. If the agents acknowledge that their actions are not resulting in the change they desire, the aggregation of their networks (as shown in the hiveplot) can help to illustrate potential gaps, redundancies, or dominant practices in their activities that could be targeted for collective action.

In our case, we found that the meta-narratives that emerged from the aggregation of the cognitive maps and the dominant practices in which the agents were engaged were incongruent. Although the narrative focused on Urban, the practices focused on Agro, potentially illustrating how the interviewees' social interactions are not involving agents with specific practices within the urban space, despite the fact that they are dominantly concerned with elements of the urban narrative in system degradation. The aggregated cognitive map and its interpretation can thus help the agents to explore what they need for transformation to happen. As others have observed, requesting that participants envision alternative regimes without explicitly discussing pathways, collaborative action partnerships, and resources to support agency that promotes the development of those new regimes will stifle the success of bottom-up, transformative interventions and spaces (Stirling 2008).

CONCLUSION

In Xochimilco, economic resources are scarce, the attention of public sector agents is often contingent on political agendas and

opportunities, and collaboration is challenged by the diversity of interests involved. We departed from a premise that change must originate from within each actor engaged in transformative processes. This is not because residents, individually, must bear the responsibility for initiating and implementing transformative pathways, but rather because without their acknowledgement of their agency and capacity (and their limits), transformation is unlikely to occur. The diverse agents in this SES have different experiences of the place, i.e., some are organic farmers, others come from irregular settlements, and others are from traditional neighborhoods, but all feel that they belong to the same place, Xochimilco. It is through investing in meaningful relationships among these diverse agents that the process of reframing what the problems are in Xochimilco can begin to take place.

We described the relevance of agency for transformation processes and how our approach may foster collective agency as we encourage individuals' agency. We suggest that our methodological approach for phase 1 may be instrumental in identifying individual agency and lay a foundation on which to build collective agency by recognizing shared values and meanings around which possible transformative interventions can be designed. Hence, it is by having access to the issues that the participants value the most that we can have an indicator of what the participants believe to be good or bad for the system. This information provides all those involved with a more transparent framework through which they can make meaningful decisions aligned with what transformation towards sustainability implies for their context. In turn, this knowledge may guide possible new collective actions through agent-developed mechanisms that will constitute a transformed space of action.

Through this approach, we posit that the initial phases toward a transformation can be convened when new relationships and alliances are formed, new ways of conceptualizing the SES and the positions of agents in it arise, and new social capitals are envisaged. Therefore, the transformation we focus on is manifested in different spaces of actions framed under the emergent system of shared values.

Responses to this article can be read online at:
http://www.ecologyandsociety.org/issues/responses.php/10214

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IV. Enabling collective agency for sustainability transformations through reframing in the Xochimilco social-ecological system *(Manuscrito científico aceptado)*

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Abstract
Collective agency, the capacity of individuals to mobilise according to shared goals, is crucial for social-ecological transformation. However, in stagnant situations, where individuals in a social-ecological system tend to resist transformation due to interests in the status quo, the emergence of collective agency faces numerous barriers. This research asks how to design and implement spaces and methodologies that help to address such barriers. We posit that these spaces and methodologies ought to facilitate processes to reframe shared perceptions of social-ecological situations through, (1) questioning dominant narratives about a situation, (2) building capacities to reframe the situation, and (3) enacting new compelling narratives that support the group's transformative agency. Our research shows that building a strong bond amongst participants is key but requires reframing tools that are infrequently used in academically-driven participatory research; in particular, tools for reflexivity while creating safe-enough spaces where participants can be truly open. Reflexivity and openness are conditions for allowing deep transformations of meanings, fostering new collaborations and promoting agency towards novel pathways forward. Through convening diverse social actors –from local farmers, residents in irregular settlements, governmental and non-governmental organisations, to academics– our 2.5-year "Transformation Laboratory" (T-Lab) showed the effectiveness of experiencing reflexive reframing tools to transform both perceived situations, and the participants' agency (i.e., the meanings and values of their role, capacities, and interests) concerning the situation. Our results support the importance of reframing in building collective agency for transformations. Throughout the process, participants deconstructed their narratives, constructed new ones, and enacted them.

Key words: Collective agency, reframing, narratives, transformations, social-ecological system, Xochimilco

1. Introduction

Agency is central to transdisciplinary projects aiming to co-produce transformations of social-ecological systems towards sustainability, but developing a sense of agency is no easy feat (O'Brien and Sygna 2013; Pesch 2015; Charli-Joseph et al. 2018; Marshall et al. 2018; Chambers et al. 2022). People living in situations of social and ecological conflict can feel socially and politically overwhelmed, with no accessible solutions. Political forces and contentious social factions can repress the development of individual and collective agentive capacities. Consequently, the notion of human agency, and more specifically transformative agency (Westley et al. 2013a), is a core concern of processes aimed at steering change for significant, structural transformation. There is increasing consensus on the importance of examining and fostering more profound deliberate and non-incremental forms of change in social-ecological systems (e.g. Olsson et al. 2014; Pelling 2014; Pelling et al. 2015) by studying the crucial role that human agency plays in fostering such processes of transformation (e.g. Westley et al. 2011, 2013). In contexts where distinct social groups face common challenges yet are embedded in disparate and often conflicting narratives of causality, blame and responsibility, building collective agency is a necessary first step in transformative change (Ojha et al. 2022). However, there is still insufficient pragmatic theoretical work, empirical evidence and methodological development in the criteria and methods to build collective agency to enhance the potential for novel interventions in sustainability challenges (Tschakert et al. 2016b, Abson et al. 2017, Charli-Joseph et al. 2018).

Recently, academic teams pursuing transdisciplinary engagement approaches have experimented with transformative space-processes (Westley et al. 2013; Pereira et al. 2018, 2020). Intentionally-designed transformative spaces are "safe-enough collaborative environments where actors invested in transformation can experiment with new mental models, ideas, and practices that can help shift social-ecological systems onto alternative pathways" (Pereira et al. 2018). Such "spaces" are also processes of social interaction, in which conflict and contention as well as agreement and solidarity can be explored with actors' consent and control. The concept of these "space-processes" is relatively new, inspired in social innovation and social-ecological systems research, entails the design and implementation of transdisciplinary approaches that involve the co-production of diverse types of knowledge, novel and experimental methods, and in-depth group dialogue (Pereira et al. 2020). Transformative space-processes provide opportunities to bring questions concerning agency to the fore, and thus explore the potential of such interventions to recognize and foster agency (Pereira et al. 2020; Drimie et al. 2021). While agency is commonly defined as the capacity of an individual to act in order to reach their goals according to their values (Sen 1999, Alkire and Deneulin 2009), it is also determined by relational and group dynamics, including motivations, cognition, and emotions (O'Brien 2012, Colombetti and Krueger 2015). In transformative space-processes, individuals as agents engage in interpersonal dialogue, learning, and reflection, so that collective agency – or the capacity of a group of individuals to mobilise in the pursuit of shared goals – can emerge.

In the context of significant injustices and inequalities that often characterise sustainability problems, reframing can result in challenging dominant narratives through articulation of alternative, subversive

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understandings that open the possibility for political action (Leach et al. 2010; Wittmayer et al. 2019). We developed a transdisciplinary intervention – a transformation lab, or "T-Lab", for testing the potential of reframing tools in fostering transformative agency from within the system. We focused on the historical tensions over land and water access and quality among the disparate stakeholders of the urban wetland of Xochimilco, Mexico City. Our aim was to create a process that would allow participants not only to reflect on their own agency, but also consider the possibility that collective agency across social divides could potentially have transformative outcomes. We focused on the complex sustainability challenges associated with a degraded social-ecological system in Mexico City, the Xochimilco wetland. We present the rationale, design, and implementation of this intervention to ask *in what ways can transdisciplinary interventions —activities and approaches— foster the emergence of collective agency?* We posit that movement from individual agency to collective agency may occur in an orchestrated reflexive process of situation or problem reframing. Such reframing should occur in a physically, socially and cognitively "safe-enough space", in which participants can reflect on their own assumptions, relationships and capacities, and collectively explore and reflect on alternative meanings and group capacities, which together reinforce collective agency.

In section 2 we present conceptual origins for the type of reframing interventions linked with agency, and in section 3 we present theoretical foundations that informed our approach; in section 4 we describe key aspects of the case study, presented as the dominant narrative in the system; in section 5 we explain our methodological approach for fostering the emergence of collective agency; and finally, in sections 6 and 7 we present and discuss our results, illustrating how the approach looked in practice.

2. Framing, social learning and space-processes for transformative change

Framing is a cognitive process to organise meanings of events, experiences, and messages (Goffman 1977). Frames also serve to guide action through abstraction (i.e., Snow et al. 1986). In sustainability scholarship, Leach et al. (2010) stress the importance of making visible and interrogating the differential framings that diverse actors have of a problem, given the normative implications of frames for pathways of future change. Leach et al (2010) define framing as "the particular contextual assumptions, methods, forms of interpretation and values that different groups might bring to a problem, shaping how it is bounded and understood" (Leach et al. 2010:46). Making social-ecological agents aware of their own framings of the system and communicating them to others can foster collective intentions and action (Manuel-Navarrete et al. 2019).

Reframing is an outcome of learning (e.g., Lumosi et al. 2019), which has been linked to transformation particularly in the Latin American traditions of Participatory Action Research and Popular Education (Fals-Borda 1987; Núñez-Hurtado 2005; Merçon 2018). Reflexivity and the questioning of one's own and others' assumptions, knowledge, goals and values (that is, the questioning of frames) are constitutive of social learning and have been associated with collective action (Pahl-Wostl 2006; Schneider and Rist 2014; Wittmayer and Schäpke 2014; Heras and Tàbara 2015; Vilsmaier et al. 2020; Rosenberg 2022).

Building a sense of collective agency arises as a result of reframing sustainability problems through learning, providing one ingredient necessary for collective action (Chambers et al. 2021; Marshall et al. 2021). When a problem is reframed –for example, a problem initially framed as one of environmental contamination from regulatory neglect to one framed as a loss in the social commitment to the preservation of an ecosystem– new opportunities for action emerge. In the former, an agent may feel helpless in front of institutional failures, in the latter, an agent may see direct opportunities to mobilise a renewed commitment to stewardship or to find new opportunities to influence other powerful actors to act in their interest. Less discussed, is the social and cognitive process associated with the formation of collective agency, and its potential role in the occurrence of sustained collective action.

In the project described here, we focus on this initial foundational process of developing collective agency as an initial ingredient of transformational change. We did not anticipate any particular 'solution' or action resulting from the project, nor were we under the illusion that the type of intervention we were proposing would necessarily result in a common vision or agenda among the participants. In other words, agency – individual or collective– is a necessary but not sufficient condition for transformative change. There are political barriers and numerous practical challenges in finding common ground and actionable pathways in transformative change processes, at multiple scales (Bentz et al. 2022; Chambers et al. 2022; Ojha et al. 2022). Nevertheless, in contexts like Xochimilco, where civil actors have been stymied and frustrated in achieving their disparate objectives, transformative change may require 'new' collective agency (i.e., transformative agency) that has

precisely not emerged from existing social-political contexts.

Thus, in transformative spaces (Pereira et al. 2018) agents are 'removed' from their habitual power-laden contexts to reflect on these positionalities and put them in perspective potentially enabling new collective agency to emerge. These safe-enough spaces seek to increase the agential power of each of the participants (in the sense of Spinoza's *potentia* explained by Armstrong 2009), so that there is greater possibility to dialogue and negotiate power relations and problem framing *collectively*: in other words, enabling the emergence or recognition of "power with" and power within the collective (Turnhout et al. 2020). Reframing processes are not apolitical: the discursive power of some actors can have significant influence over how problems are understood, how responsibilities are positioned and what actions are considered plausible (Avelino 2021). For precisely this reason, the design and implementation of a T-Lab process requires explicit attention (Drimie et al. 2021; Pereira et al. 2021).

3. From reframing to collective agency: the T-Lab

We understand the connection between reframing and agency to be cognitive, through the process of sense-making (Varela et al. 1991, Chemero 2009, Di Paolo et al. 2017). Cognition is more than rational thinking; it also entails how agents *make sense* of their environment to thrive and develop in a way meaningful to them. Meaning emerges through the normative and affective responses associated with any agents' interaction with the world, reinforcing a sense of identity and socially-shared values and beliefs, which then can

motivate action (Charli-Joseph et al. 2018; Siqueiros-García et al. 2022).

Following Leach et al (2010)'s definition of framing (cited above), we add that frames are embedded processes of sense-making in a concrete historical, social, political and ecological context. Given that frames are for and about things that matter to someone, they are also imbued with affectivity. Accordingly, we see frames as: 1) Particular configurations or networks of possibilities for action (Benford and Snow 2000), given a situation or scenario; 2) Relational, enacted and lived as long as they are realised in everyday life -for example, about how to farm or how to deal with water scarcity, thus giving meaning or explanation to a reality; 3) Historical, as they are constrained both by past experiences of agents and community and by expectations of the future; 4) Social, because they are developed and shared in the context of interaction with other agents; 5) Dynamic, as they adapt to the context as agents find themselves in new and different situations, also, they can change radically due to external disturbances (e.g., political upheaval, earthquakes, or the emergence of heat islands in cities from deforestation); 6) Normative, because they can be right or wrong about a particular situation under certain conditions and hence hinder or foster diverse responses to rapidly changing environments from climate change, for example.

Agents are rarely conscious of their frames; frames are simply enacted. However, in narrative form, they can become an object of reflexivity: presented and questioned. Because narratives are essentially verbal forms in which frames are enacted, analysis of narratives is helpful for revealing underlying frames (Marshall et al. 2021; Riedy 2022). Narratives can be explored to discover connections assumed as pre-given

as well as to unveil or even create new ones, and hence play a central role in agents' self-construal and thus sense of agency. Acting on narratives is to act on frames.

To create conditions for social change, Emirbayer (1998) explicitly advocates approaches that enable actors to engage analytically with the dynamics of their individual agency over time, arguing that their expression of agency sustains and shapes the structural conditions of their action. Social interactions, such as group discussions, community meetings, participatory workshops or informal conversations provide opportunities for people to build collective visions and create social and affective connections necessary for a sense of collective agency. Nevertheless, orchestrated dialogue and social exchanges do not mechanically lead to the convergence of motivations, values, and a shared sense of responsibility to others (Pelenc et al. 2015). It is through negotiating differences and articulating alternatives that problem frames shift, and, while there may not be a consensus on what action to take, the possibility of alternative approaches and pathways forward becomes tangible. For example, Gergen et al. (2007) present the notion of "transformative dialogue" as any form of conversation that leads to transforming a relationship between different actors (especially those holding different aims or agendas) to one in which a shared vision is visualised and implemented. Importantly, Heras and Tàbara (2014) emphasise the relevance of using participatory approaches to explore personal experiences, values and emotions for more transformative aims. Power relations play crucial roles in these deliberative processes: asymmetrical discursive power and political position can silence some narratives and elevate others (Turnhout et al. 2020; Avelino 2021). How dialogue and deliberation is

approached and orchestrated can help mediate such outcomes (Chambers et al. 2022).

Interventions such as those in T-Labs imply explicit questioning of given narratives for all participating actors (including the researcher-conveners), and thus associated values and beliefs and underlying frames (Pereira et al. 2021). These interventions may have greater potential for fostering collective agency if done by creating a cycle of reflection coupled with exploring and experiencing different possibilities of action as well as fostering interaction among agents with different frames and with their social-ecological environment. This reflection and action cycle can make our assumptions visible for further interrogation and create new ways of doing and thinking (Figures 1 and 2).
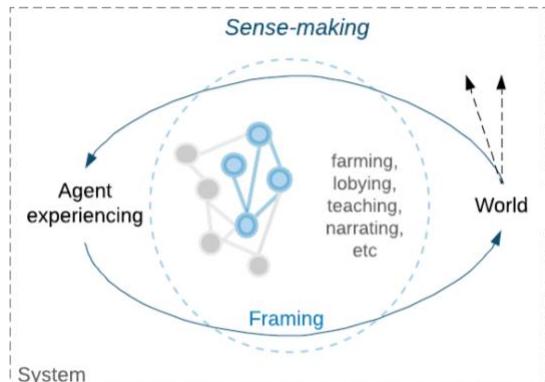
Fig. 1. Framing

The agent acts on the world and the world affects the agent; thus, frames emerge from this interaction. The grey network is the entire space of possibilities for action; the bold network is the agent's active frame which shapes the possibilities for action in a particular situation created between agent and world. The world has properties that are not perceivable by the agent (dashed arrows outside the network), therefore they are not opportunities for action and are not included in the frame.
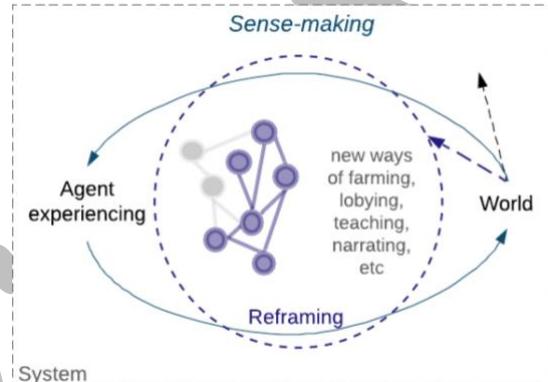
Fig. 2. Reframing

If reframing occurs, those properties not perceivable can become part of the network of possibilities for action (new dashed arrow entering the network). After an intervention, more of the underlying shadow network is incorporated into the understanding and possibilities for action. By changing the network, narratives may also change. Reframing allows an agent to perceive a different connection between themselves and the world.

We hypothesise that when the frames of a group are changed through an intentional participatory process, such as a T-Lab, the group's collective agency will also be affected. Thus, reframing can occur by engaging in intentionally designed activities that help reposition agents and connect them with other agents and with the environment in previously unexplored ways. To operationalize this approach, the T-Lab was organised as a process aimed to foster reframing through exposing participants to diverse experiences. To organise our methodological strategy (Section 5), these experiences were structured in three loops of reframing to build the conditions that could lead to an emergent collective agency: Loop I – "Deconstructing narratives"; Loop II – "Creating new narratives"; and, Loop III – "Enacting new narratives" (Figure 3). In our

case, narratives were conceptualised as verbal acts of sense-making derived from individual and collective experiences and of a history of struggles with environmental and

social degradation of the Xochimilco social-ecological system.
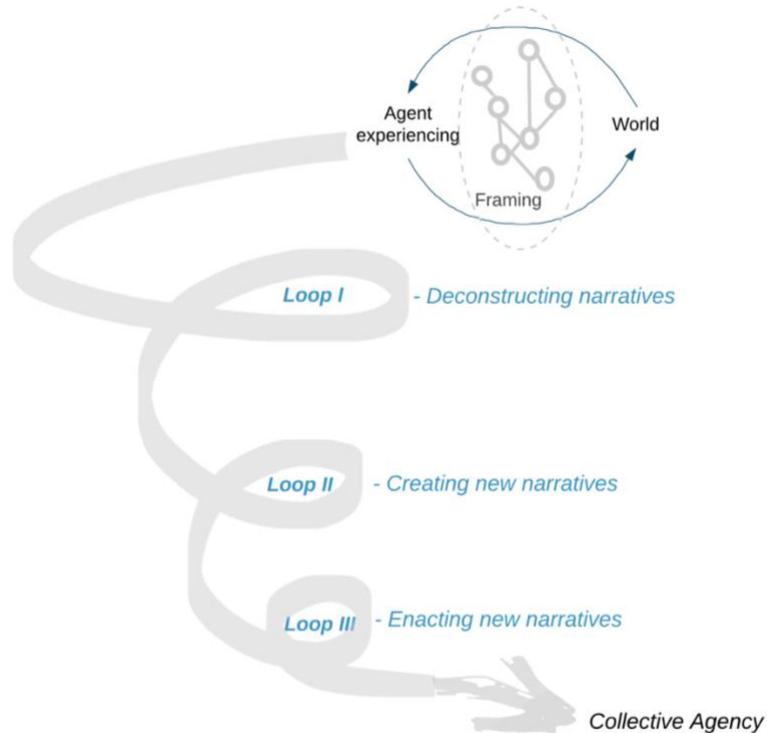
Fig. 3. Three loops of reframing to build collective agency.

4. The Xochimilco urban wetland: a social-ecological system in peril

The research team, as the T-Lab conveners, was part of an international consortium coordinated by the University of Sussex that aimed to test the T-Lab as a mode of 'intervention' for transformative change (Ely et al. 2020; Pereira et al. 2021). We identified the case of the Xochimilco urban wetland in Mexico City as particularly apt for exploring how a T-Lab process could potentially foster collective agency, as a first step in any transformative change process (Eakin et al. 2021). The Xochimilco wetlands host artificially constructed elevated farming

systems, called *chinampas*, used for cultivation since the Aztec times and considered one of the most productive agroecosystems globally (Armillas 1971; Cram et al. 2008; Jiménez et al. 1995).

The resources of Xochimilco have long been a subject of struggle and contention. The springs that historically fed the original shallow lake of Xochimilco were actively sought after as sources of fresh potable water for the growing pre-Hispanic settlement in the Mexico City Basin, putting the livelihoods of farmers (*chinamperos*) in tension with the water needs of the urban centre (Tellman et al. 2018).

For decades, different actors –both local and international– have attempted to halt the demise of the wetland and restore its ecological and agricultural viability, but with limited success. International efforts to reverse wetland decline and preserve the remaining chinampa have included the designation of the wetland as World Cultural Heritage in 1987 (UNESCO 1987), a Natural Protected Area in 1992 (GODF 2006), a RAMSAR wetland in 2004 (PAOT 2010), a Natural and Cultural World Heritage Zone of Xochimilco, Tláhuac and Milpa Alta (AZP) in 2012 (GODF 2012), and a World Agricultural Heritage site by the Food and Agricultural Organisation in 2017 (FAO 2018). Nevertheless, the area faces continued internal and external stressors, and public sector and civil society efforts have been fragmented, politically fraught and contentious. With urbanisation, there has been a gradual decrease of agricultural workforce, and, with the adoption of more mechanised and commercial farm practices contamination from farming has increased (Mazari-Hiriart et al. 2008b, González-Pozo 2016). Mechanisation has created conflict within the *chinamperos,* pitting more traditional producers against those adopting more modern technologies and practices (Pérez-Belmont et al. 2021). Farmers are also complicit in the urbanisation process by informally selling their *chinampas* for urban construction and settlement (Eakin et al. 2019b), a fact that complicates social organisation to halt wetland degradation. Irregular settlers also face complex problems such as land subsidence and constant flooding, the absence of piped water and sewage services, and associated health issues. Irregular settlers live in an urban 'planning limbo' (Wigle 2014) in conflict and tension with farmers since many settlers have occupied abandoned chinampas and wastewater is discharged to the canals (which

contributes to the perception of farmers as being responsible for further polluting the water used for farming). There is tension with local politicians as well because there is a permanent struggle to demand access for basic urban services which are frequently denied due to legal arguments that stipulate that only regular settlements can be granted with such services (Wigle 2010). Local politicians and public officials, mandated to help halt illegal urban encroachment in the wetlands, are often accused of being complicit in the process by helping distribute building materials and other goods in exchange for votes (Eakin et al. 2019b).

Despite the complex relations of causality, complicity, and blame, the politics of Xochimilco degradation is embedded in a narrative that pits irregular settlements against the more traditional *chinamperos*, and both the farming and urban communities dependent on the wetland in conflict with the city and federal institutions that they feel do too little to protect their interests (Eakin et al. 2019b; Siqueiros-García et al. 2022). In this political context and fragmented social organisation, the T-Lab thus focused on the persistent tension over land tenure and water use between two local groups: farmers and people from irregular settlements. Rather than frame the T-Lab process in a narrative of an unsupportive state, our aim was to focus on the relations of actors within and directly dependent on the social-ecological system and their individual and collective agency for transformative change.

5. Methodological approach

In light of the challenges facing the urban wetland of Xochimilco, and, in particular, the sense that past and current interventions have done little to alter the system's trajectory (Manuel-Navarrete et al. 2019), we focused

the "T-Lab" on implementing methods towards re-defining individual and collective agency itself within such particular context (Manuel-Navarrete et al. 2021). Challenging entrenched system inertias would require a safe-enough space for reframing *by doing*, *engaging,* and *reflecting* in group activities. Such activities were based on hands-on work, intense deliberation and dialogue aimed at discovering new ways of seeing, feeling, acting, and engaging within Xochimilco social-ecological system.

Throughout more than two and a half years, we periodically convened a diverse group of 13 participants – including local farmers, residents from irregular settlements, government officials, non-governmental organisations, and academics involved in the use and management of the Xochimilco urban wetland. While we worked to distribute organising power to the participants in the process, the research team, as a group of 'knowledge elites' was the initial convener and thus had control over the selection of participants and the overarching framing of the T-Lab itself (Turnhout et al. 2020). While we recognized this power, in the initial interactions the research team conveyed to the invited participants their aim for the process to be co-owned and collaboratively directed by all participants. We also made clear that as the conveners of the process, we had no preconceived notions of specific outcomes or products from the process, and that there was always a risk that nothing substantive would come of the process. No one was obligated to continue with the project if they found it unconstructive, too time consuming or ultimately not in their interests. With this transparency in purpose and approach, the convened group participated in and helped design a series of

experimental activities to transform the way they experienced the system. Activities questioned participants' roles in urbanisation and wetland social-ecological dynamics, as well as their relationships as a group, while seizing unexpected contingencies (i.e., earthquakes), thus creating favourable conditions for reframing, social bonding and group identification.

Two methodologies were designed by the research team, rather than the participants, and were employed throughout the process as a means of assessing aspects of reframing and expression of agency. These were: Agency Network Analysis (ANA), a methodology developed to articulate agency networks and cognitive maps (Charli-Joseph et al 2018), and Q-Methodology (Webler et al. 2009; Zabala 2014). Both were applied at the beginning and at the end to record changes in the social network of participants (a proxy for the conditions that may foster collective action), in their conceptualization of the problem space (their narratives and thus frames), as well as in their system of values (as a means of accessing the normative dimension of the relationship between agents and their social-ecological environment). These methods produced specific material outputs such as cognitive maps, ego-nets, action-nets, power-nets, and Q-sorts, that were used to monitor change in individuals and identify new and different narratives as evidence of reframing[7]. ANA and Q-Methodology were also used as inputs to the group to promote discussion and reflexivity[8]. In other words, the process of completing ANA and Q-Methodology exercises provided participants the opportunity to reflect on their capabilities, their social relations, their narratives and actions, and thus were part of the process of reframing. Other activities and

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[7] For details see https://github.com/sostenibilidad-unam/tlabs/tree/master/Q_methodology

[8] Greater detail on all the activities can be found in Charli-Joseph et al. 2018 and in Ruizpalacios et al. 2019.

interventions were proposed and led by specific participants in the T-Lab as it evolved (e.g., a problem tree analysis, site visits, pedagogical training), according to their interests and ideas on how to foster the interactions they desired (Ruizpalacios et al. 2019).

Prior to interacting with participants, the research team assumed "chaotic urbanisation" as the dominant frame of Xochimilco's social-ecological system, given our prior work on narratives and discourse in the city (Lerner et al. 2018; Eakin et al. 2019b). This assumption guided our selection of participants (Charli-Joseph et al. 2018). Following initial interviews, we invited specific individuals to participate in the T-Lab process according to explicit criteria associated with change agents. These criteria included actionable social networks, capacity and willingness to experiment with different approaches, sense of attachment to the place, solidarity and empathy with respect to other communities, among others (see Charli-Joseph et al. 2018 for details).

We organised the tools employed in the T-Lab to correspond with each reframing loop (Figure 3): i.e., as tools for narrative deconstruction, for opening to the emergence of new narratives and for enacting such new narratives. For each loop, the tools were applied iteratively. Group changes were monitored throughout as possible indications of collective agency emergence.

For Loop I, "Deconstructing narratives", we adapted the 3-Horizons method (Sharpe et al. 2016), and designed a participatory mapping exercise to elicit values and meanings shared as a group (see Ruizpalacios et al. 2019 for details). From these exercises, we expected to observe that participants would begin to

question their individual narratives, recognize their potential flaws, and the possible inconsistencies of the frames expressed in such narratives. We iteratively explored questions such as *What is(are) the main problem(s)? Why is it a problem? Who else portrays it as a problem? What are its causes? What are its elements and scope?* A series of reflexive exercises revealed participants' pre-established narratives; the underlying assumptions of such narratives were directly and indirectly debated in workshop discussions.

For Loop II, "Creating new narratives", we focused on reframing through reconfiguration and emergence of new narratives. Exercises were designed to reposition the role of individual agents in the system. These exercises made individual agency visible, and thus the object of reflection (e.g., capacities, responsibilities, roles, etc.). Individually, we conducted semi-structured interviews with each participant to develop agency networks with ANA. Each participant constructed avatars[9] (symbolic visual representations of each participant) and assigned their avatars "powers". Walkshops (i.e., Wickson et al. 2015) provided engagement with place-based activities and perspectives of others in the group. They sought common meanings and shared values through, for example, exploring questions such as *What do I do, with whom, and where in the system? What are my capabilities? How do others affect the system and how are they affected by the system? How does their world look to me? What does it mean to think differently about the system and its problems?* From these activities we expected changes in agents' perception of their own roles, and their understanding of both individual and group capacities in relation to their environment.

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[9] https://github.com/sostenibilidad-unam/tlabs/tree/master/Avatars

Thus, a change in individual and collective narratives (i.e., a different narrative about the system and about other actors that affect or are affected by the relevant issues in the system) that would enable designing new actions and ways of engaging with the system from within.

For Loop III, "Enacting new narratives", interactions were planned to re-design and co-create new (more transformative) actions by exploring alternative pathways towards desired states and trajectories of the system (guiding questions were *What decisions might confront us? What are the implications? How do I implement new ways of acting?)*. Hence, the main objective was to start experiencing and doing things from new frames. This loop involved activities such as designing a role-playing game to explore collective decision-making (Ruizpalacios et al. 2018), as well as writing "Tiny Books"[10] around what was learned, what was the relevant feedback, and what would be the desired ways to continue the process; and

thinking through the design of participatory tools in a transformative pedagogy workshop. From these activities we expected to see a change in how participants viewed the goals for the system and alternative pathways to achieve it. We also anticipated that they would begin to change their individual and shared actions and ways of engaging with the system.

By observing changes in framing at different levels we could assess if activities throughout the process provoked alternative ways of thinking and acting. Nevertheless, such assessment is not sufficient to conclude that there is an emergence of collective agency. Other tangible and intangible outcomes related to the building of collective agency were 1) Identification of individual agency and group capacities; 2) Group identity formation, e.g., a shift in the use of pronouns from *I* to *us*; and, 3) Alliance building, and planning and/or implementing shared actions (Figure 4).
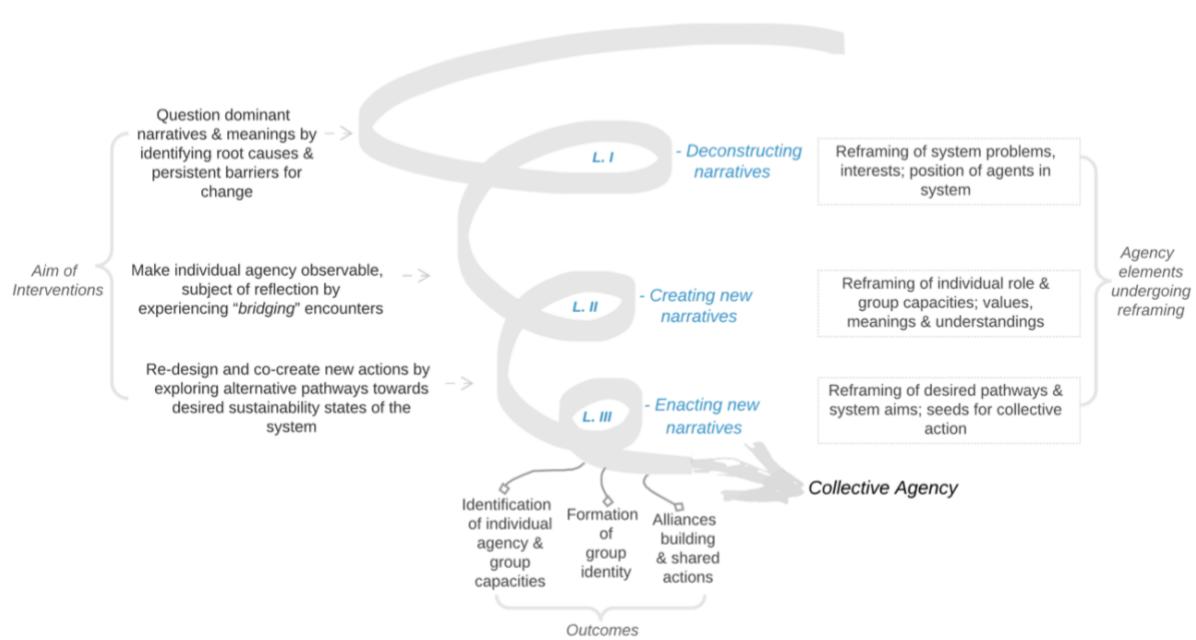
Fig. 4. The conceptual diagram of the three-loops reframing process approach: the aim of the interventions, the agency elements undergoing reframing, and the key outcomes to be observed.

To recognise signals of potential change towards the emergence of collective agency we focused on a suite of specific changes that we expected to observe at the individual and collective level (Table 1). We also kept track of any changes in activities or social alliances that could be construed as evidence of emergent collective action.

Table 1. Criteria to identify the emergence of collective agency

Outcomes	Level	Specific potential changes to be observed	Tools and methods used for each change
Agency & group capacities	*Individual*	a) Perspectives about the system: more systemic view, affective view/understanding b) Perspectives about oneself and about others: situating self within problem domain, better understanding of roles and interests of others, recognition of capacities and 'powers' c) Responsibility and role in the system (and/or in decision-making): recognition of need for change "from within" (from exogenous to endogenous drivers)	- Agency Network Analysis (ANA) [Agency nets and Cognitive maps] - Avatars
	Individual & Collective	d) Learning: Use and appropriation of new knowledge; Reflections of the intervention process as a result of the T-Lab process	- Semi-structured interviews - Participatory workshops - Participant observation - Tiny Books
Identity	*Collective*	a) Sense of group unity: use of pronouns "we", "us", our group, etc; recognition of shared group aim b) Sense of mutual values and meanings: from *shared* to collective *co-constructed* values and meanings	- Values and meanings mapping - Dioramas of possible worlds - Pathways to Sustainability Game

6. Results

The evidence of reframing and collective agency that we found along the T-Lab process are presented herein, clustered in two moments: T_0 - The baseline of narratives, and T_1- Change in narratives.

6.1. Deconstructing narratives: baseline

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Before any collective interaction, the baseline of individual narratives was elicited with the Q-Methodology, with ANA, and with avatars mapping, through interviews with the 13 participants.

The Q-Methodology included 28 statements referring to four themes: property rights, identity and values, pressures in the ecosystem, and livelihoods. From this analysis, four meta-narratives emerged at T_0 (Qa): The first meta-narrative, "Agriculture viability", associated with the majority of participants (6 of 13), and typified as the dominant viewpoint. This narrative was rooted in the belief of the crucial need for agriculture viability and was characterised by the notion that urbanisation was the primary cause of system degradation. The second meta-narrative, "Heritage relevance", presented strong agricultural focus, associated with heritage, identity and the cultural value of the *chinampa* and biodiversity (with 3/13 aligned participants). The third meta-narrative, "Urban and agricultural balance", attributed degradation to urbanisation and to agriculture, recognizing that people sometimes have no other alternative than to live in their *chinampas*, which then leads to urbanisation (with 3/13 aligned participants). Finally, the meta-narrative "Wetland resilience", revealed a perception that the wetland is resilient despite agricultural activities, which was presented as not completely disturbing the functioning of the aquatic ecosystem; with an emphasis that young people aspire to continue traditional agricultural practices in the chinampas (with 1/13 aligned participant).

The meta-narratives were further explored through eliciting individuals' perceptions and

understanding of the system. We aggregated the cognitive maps of the individuals that were associated with each of the meta-narratives. This analysis allowed us to understand the relationships among specific concepts associated with each meta-narrative through network analysis metrics: the most significant perceived drivers (outdegree), the most important mediating conditions or connectors (betweenness centrality), and the most prominent outcomes of concern or receptors (indegree)[11]. Although all meta-narratives were composed by drivers predominantly associated with social-political processes (i.e., lack of public policy implementation, of participation from civil society, and of institutional coordination), their most significant receptors or outcomes of concern differed.

Visualisations of the cognitive maps were also generated and compared to elicit direct cause-effect relationships between the variables. This allowed the identification of the closest neighbouring variables affecting each other, and thus showed how the participants perceived the functioning of the system. When integrating the cognitive maps of the individuals per meta-narrative, we identified how many participants per meta-narrative connected the same variables in the same way. Thus, eliciting specific convergences in conceptual relationships inside the narrative, allowing a more articulated understanding of each narrative.

For example, for the meta-narrative "Agriculture viability" (Figure 5), the most significant receptor (determined by the highest value of *indegree*) was *chinampas abandonment*, and the visualisation in Figure 5 shows that it is directly and most frequently caused by *chinampas urbanisation (due to*

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[11] For details see Table A in
https://github.com/sostenibilidad-unam/tlabs/tree/master/CogMaps_integrated

land use change), and by *young people not working in agriculture (*due to *lack of market).* In addition, and although some of the nodes that appeared larger in size (i.e., *water contamination*), these were not elicited as the most significant receptors due to their total difference between indegree and outdegree values (i.e., *water contamination* Ind=6; Out=9; Distance=3).
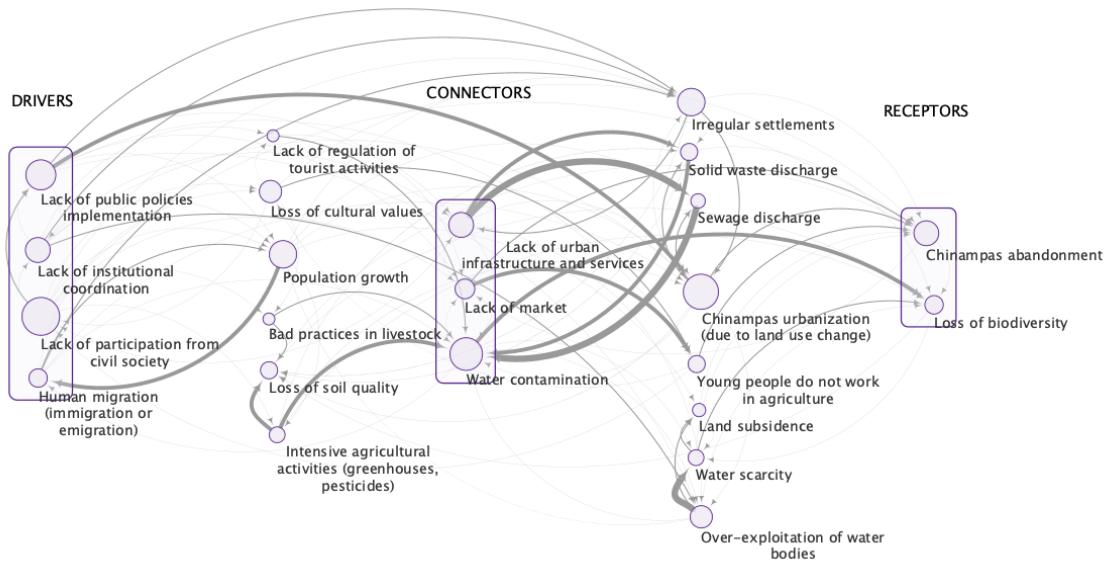
Fig. 5. Integrated cognitive maps of participants that constituted the meta-narrative "Agriculture viability" (Ac-01; Ch-07; Ch-10; Cs-016; Ngo-18) organised from left to right by drivers, their neighbours, connectors, their neighbours, and receptors. The thickness or width of the connections represents the number of participants that coincided in linking specific variables in the same way (four widths are present: the thinner, almost transparent links show that only one participant connected the variables in a specific way, the next width represents that two participants coincided in linking specific variables, the next one shows that three participants connected the same variables, and the thicker connection means that four participants converged).

Our initial mapping of participants' social networks documented the primary collaborators of each participant in the system, as well as which activities each participant was involved in. This mapping showed that while they shared some collaborators, they were not all directly engaged in each other's networks of action.

Baselines were also observed with regards to how each participant represented their skills or "powers" with their avatars at the start of the process. These exercises demonstrated that from a total of 23 powers distributed among 10 of the total 13 participants, 15 were common in the group. From these 15 powers, three were shared between more than three participants: four participants shared the powers of *to coordinate*, and *to get tangible results,* and five participants shared the powers of *to innovate,* and *to connect people*. There were also unique powers in the group (i.e. provided by only one participant) such as *to challenge*, *to inspire and guide others*, *to revolutionise*, or, *to foster change.*

6.2. Creation of new narratives

6.2.1 *Evidence from Q-Methodology*

If there had been no change in narratives, we would expect the same general factors to emerge in the second application of the Q-Methodology (Qb) carried out at the end of the project (T_1), with only minor differences, and the same agents' affiliation with each meta-narrative. However, this was not the case. In Qb there were similar narrative themes, but slightly different interpretations given the changes in statements associated with each meta-narrative. In addition, no single narrative was as dominant as in the first iteration of the Q-Methodology. The meta-narrative "Urbanisation incompatible" that was the most "anti-urban" and strongly pro-agriculture, had only 4/13 participants affiliated. The presence of different statements into the meta-narrative "Generational shift in priorities" presented a more nuanced narrative of social-ecological change (i.e. breakdown of strong urban vs. agricultural dichotomy) and a more distributed responsibility of people maintaining the system (i.e. shared responsibilities of inhabitants and visitors of the wetland), that reflected a recognition that young *chinamperos* play a significant role in the heritage persistence due to their interest in sustaining agriculture (with 5/13 participants, a group composed mainly of civil society participants). The remaining meta-narratives had fewer participants

affiliated: "Urban empathy" with 3/13 and "Rooted identity" with 1/13. However, in contrast to the other meta-narratives, "Urban empathy" was composed of statements that were more associated with empathetic notions towards urban phenomena. While recognizing the value of chinampas and the environment, this narrative rejected to fully blame urban processes, indicative of a shift in values and self- and other-positioning. Finally, the meta-narrative "Rooted identity" was characterised by statements that associated preservation of the system with biodiversity conservation and that recognised the lack of related efficient public policies. Furthermore, this narrative suggested that although *chinampas'* agriculture continues to have relevance for Xochimilco families, agricultural practices have lost spiritual significance.

Notably, six of 13 participants demonstrated a marked change in their identification with statements in the Q sorts, suggesting a shift in their identification with narratives, particularly from "Agriculture viability"– the most divisive narrative – to other more nuanced and balanced perspectives (e.g., "Generational shift in priorities" and "Urban empathy", see Figure 6).
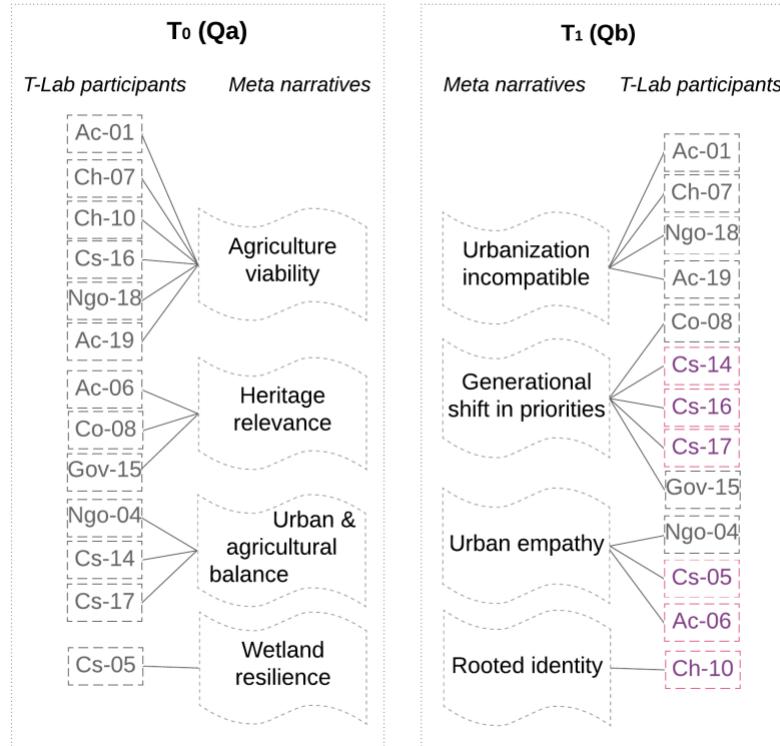
Fig. 6. The meta-narratives that emerged with the Q-Methodology factor analysis [(a)=baseline; (b)=change]. Total N = 13; Participants' codes correspond to: Ac=Academia; Ngo=non-governmental organisation; Cs=Civil society; Ch=*Chinampero(a)* (farmer); Co=Consultancy (private); Participants in purple are the ones that changed to a significant different narrative in Q(b), N = 6/13.

6.2.2 *Evidence from the cognitive maps*

By relating the analysis of the aggregated cognitive maps of all the participants to the Q-analysis, we associated certain shifts in individual perceptions that could be interpreted as a response to social engagement and group identity formation through the T-Lab (as well as external factors such as a 2017 earthquake in Mexico City that heavily affected Xochimilco). From this analysis we found that there was a shift in types of drivers, connectors and receptors associated with meta-narrative "Agriculture viability", the initial dominant meta-narrative in comparison with meta-narrative "Urbanisation incompatible". For

"Urbanisation incompatible", the drivers were mostly about the responsibility of farmers and civil society and less about politicians (i.e., Bad practices in livestock; Intensive agricultural activities); and receptors pointed farmers as contributors to urbanisation and contamination[12].

6.2.3 *Evidence from the interviews*

The shifts in narrative were also captured in the individual interviews with participants over the course of the T-Lab. For example, one participant observed that *"... the problem [social-ecological degradation] is not going to be only in the chinampa area, but the problem is going to be in the urban area"*

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[12] For details see Table B in
https://github.com/sostenibilidad-unam/tlabs/tree/master/CogMaps_integrated

(Ch-10). The shift in focus was not only in terms of location of the problem, but also in relation to value: *"From the first session I realised that this was entirely the case, that [the T-Lab] had no head or tail, but it had emotion"* (Cs-14). One participant from civil society noted that the notion behind the T-Lab was to deconstruct paradigms, and thus see the system differently: *"What I discovered from the T-Lab [...] was a new willingness to listen to different points of view ... if we question the paradigms in which [the community] is embedded and from there reconsider them, but the proposal has to be about deconstructing ideas of what life is ... And it's precisely because the effort focuses on those problems, it's not that I didn't know about them [before], but I hadn't seen Xochimilco like that, or rather one forgets [...] so it does help to see it again"* (Cs-16).

6.3. Enacting new narratives: expression of agency

6.3.1 *Recognition of individual agency through avatars*

Participants' self-analysis and use of their avatars proved constructive in articulating individual agency. In a post-earthquake encounter, participants mapped their powers to explore shared skills and collective earthquake responses. Over diverse activities in the T-Lab, participants called on their powers to explore different courses of action. In T_1, some individuals presented more and different powers than in the first mapping (see Figure 7).
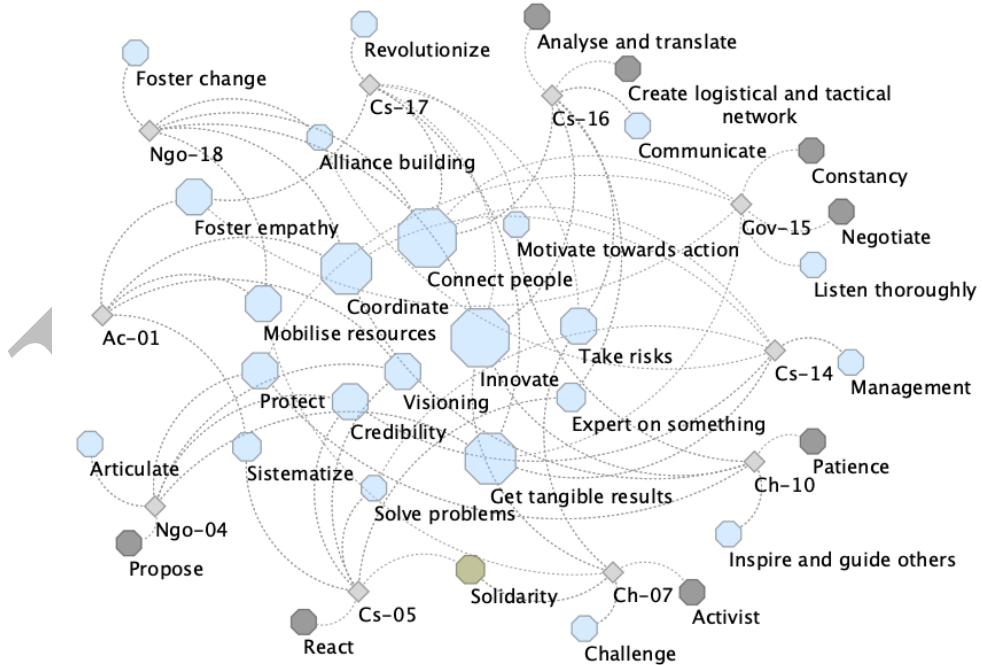
Fig. 7. Power network in T_1
Individual powers are shown in the periphery and shared powers in the centre. The size of power nodes is determined by their centrality degree (i.e., bigger nodes have more connections). New individual powers that were registered in T_1 are shown in black nodes (and in brown the one that became shared).

When asked to reflect on this mapping exercise, one participant noted how this allowed her to gain new insight into how she had agency in her daily life: *"To tell the truth, we all know that we are doing good things but [...] I hadn't seen this as "power" [...] to see it as power [...] even I came away with new ideas [...] to want to go out and change the world [...] I'm good at this!. [...] knowing that I have an avatar, a power, it gives me strength, it gives me the security that perhaps is needed to do it... It showed me characteristics or attitudes and aptitudes that I did not know or personally had not consciously recognized"* (Cs-14). Another saw his avatar's powers as exemplifying his inner potential for leadership: *"I believe that the avatar of each one is the characteristics that we have, and in fact, we are representatives, and we are leaders. We each have certain characteristics, and if we put those characteristics together [...], they are qualities that each of us who were there have. [...] [It's] something cool, maybe I was doing it but maybe I hadn't discovered it -- that leadership to support people, that intention of* motivating others. I wish we had the powers of our avatar to work and fix the area"* (Ch-10). And a participant explained how the avatars helped in reinforcing identity and agency: *"... At the end of the day you put yourself in a space and you start to see how you occupy that space and how you influence the time and the space that you have around you, regardless of where it is. You will have that all the time and you will be able to apply it where you are standing and if it serves to solve problems or to jump barriers, well it is a power, right? Well, it did help me because, you identify yourself"* (Ch-02).

6.3.2 *Evidence from the agency-nets*

The analysis of ego-nets and action-nets across the temporal span of the T-Lab process illustrated new interactions and collaborations among some of the participants (see Figure 8 for an illustration of these convergences)[13].

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[13] For details see https://github.com/sostenibilidad-unam/tlabs/tree/master/viz
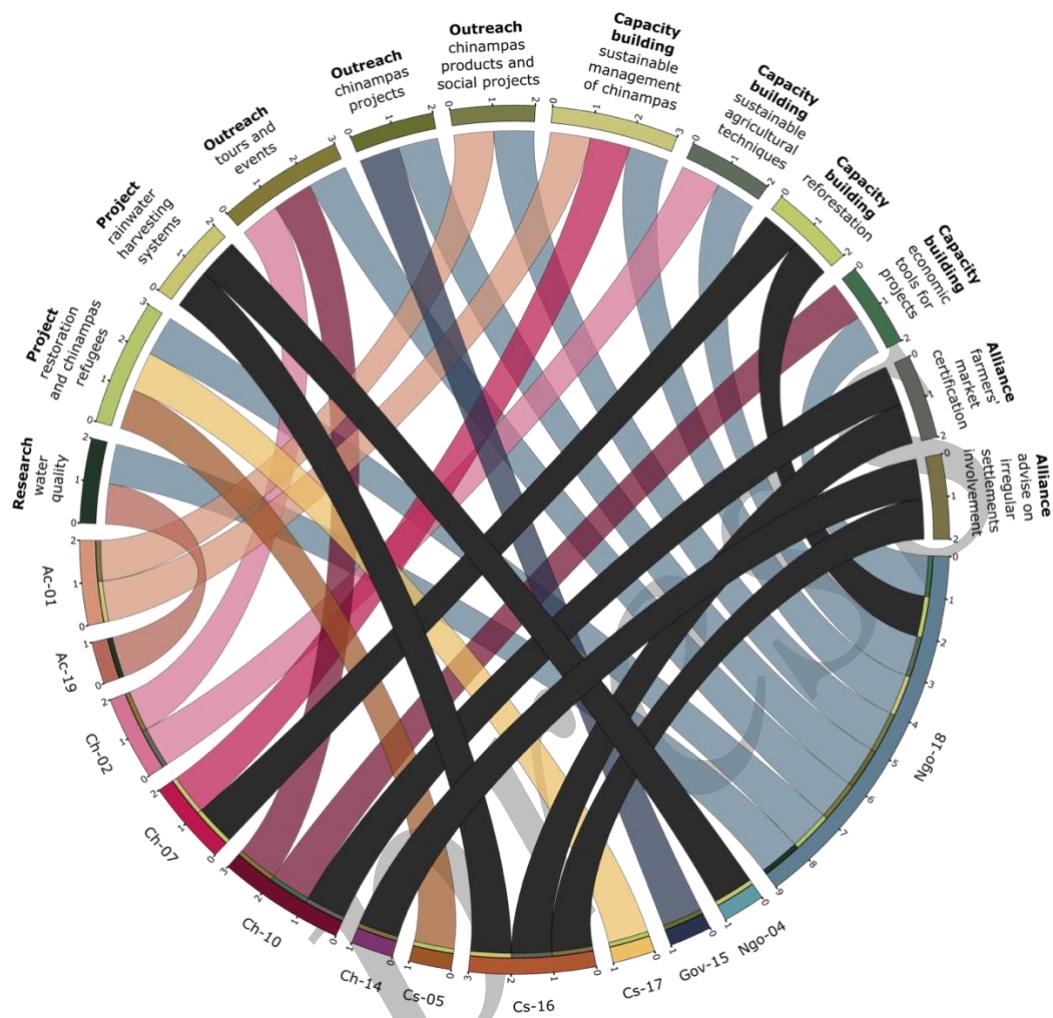
Fig. 8. Agency network of participants. Nodes in the network are the outmost segments among the circumference, ribbons show connections. Green nodes represent actions, ribbons have the colour of their source node which always represents a person (there are no green ribbons because actions are always a target) [Cs = Civil society; Ac = Academia; Ngo = Non Governmental Organisation; Ch = *Chinampero(a)*/farmer; Gov = Government]. Ribbons in black show reported shared actions and collaborations after the 2017 earthquake in T_1. There is growth in the network from T_0 to T_1 which can be seen in the increase of nodes and edges.

There were stronger interactions between some participants than others. These interactions manifested in the expression of shared values, complementary capacities and skills, as well as use of information infrastructure (i.e., first through a Facebook group, then a WhatsApp chat group that is still alive today to communicate without mediation by the research team). At the end of the last workshop, participants agreed on following a pedagogical approach to learn about alternative methods to facilitate learning encounters with their communities. When this extra workshop emerged, participants planned specific interventions, showing evidence of recognition and sharing of capacities, positionalities and alliances.

6.3.3 *Change in meaning-making and individual responsibility*

In the first interactions of the T-Lab process, the conversation focused on technological and financial interventions intended to forward individual projects or needs (e.g., rainwater harvesting systems, and bio-filters), reflecting the dominant framing of the problem as one of technological deficiency and water quality and considering external factors as the main causes of the problem. As the T-Lab progressed we observed a shift to a dialog on intangible elements of the system: affective concerns and needs shared not only by individuals but by the local community at large (depression, alcoholism, etc), and interventions that might address these social concerns. This process was facilitated by an exercise in visualising tangible material elements of the system that were valued, and then discussing meanings and values associated with these attributes (Eakin et al. 2019).

Participants demonstrated a shift in how they sensed their responsibility in relation to the system. An observed component of the initial dominant framing was the notion that 'help' needed to come from 'outside'. By the end of

the T-Lab process several participants were expressing a need for a change to come from inside: *"it is necessary to make these changes from within"* (testimony in first workshop); *"Transformations have to come from the inside, when they come from the outside, they become efforts that do not last"* (Ch-02).

As some participants began to appreciate alternative perspectives, they amplified their vision of responsibility and of individual agency. One participant reflected, for example that she was concerned that the dialogue in the T-Lab would be very biassed towards the *chinamperos*, villainizing the irregular settlements. Nevertheless, she realised she could speak up and help vocalise an alternative perspective and narrative: "*I want them to talk about settlements [...] because I told you that that isn't the problem, remember? And everyone was like "yes those damn settlements" and I was "no, no, please…"*. "*It was that session when I said, we don't have to position the issue that way*" (Cs-14).

6.3.4 *Emergence of collective identity and agency*

We observed some evidence of participants' learning about the needs, values and interests of "others", indicating a basis for collective identity. For example, one participant recognized the role of the T-Lab in bridging divides by uniting the two "worlds" of the *chinamperos* and the irregular settlements in the area designated for conservation: *I believe that things or actions can also be linked and established between the two worlds so that they can both have the same objective, the conservation of the land. The T-Lab was important in that sense, it was able to establish relationships between the actors*" (Cs-14). The same participant reflected on what they learned after playing the Pathways

to Sustainability Game[14] with a mixture of *chinamperos* and individuals from the irregular settlements: *"I learned how one should work together; how things should be done; how to talk." "We were all able to conclude that we want a dignified, sustainable, ecological habitat"*.

When some of the participants were asked whether they had observed the emergence of any commonalities that could foster the formation of a group identity, one responded: *"I think so … we have already achieved a group identity. If we compare it to a seed, it has already germinated, maybe you have already planted that seed and maybe it is already in the sprout that I produce, if we compare it, right? And if we take care of it and we strengthen it, we will really have a plant and then a tree. [...] I have learned a lot... and I would recommend it to other producers, to get involved with groups like this, to change that way of thinking"* (Ch-10). Another participant commented that *"The T-Lab seems like a good project to generate community, I think that is what I take from it the most, that is, the reflection that has been taking place for more than two years and a half, of somehow generating certain ties to be strengthened"* (Cs-16).

The participants recognized that the interpersonal connections that the T-Lab had fostered were a first step in a longer trajectory of change. Another participant commented that *"The T-Labs are just one example of this necessary preliminary work that has to be carried out to eventually be able to reach the point of achieving a different development model for two things: the co-creation of these structures of conversation and [...] the construction of a network of people talking. T-Labs are an essential step [...], it is like a seed that begins to germinate and still needs*

a lot of work and a lot of effort, but the foundations are already beginning to be built" (Ngo-04).

7. Discussion and conclusion

While there have been many calls for transformative change in face of the significant sustainability challenges different groups now face, the "how" of transformation has received less attention (Scoones et al. 2020; Bentz et al. 2022; Ojha et al. 2022). Nevertheless, shared meaning-making and collective agency are considered critical ingredients in transformative pathways (Chambers et al. 2022; Riedy 2022). The Xochimilco T-Lab was not intended to result in any specific trajectory of change or transformative outcome. Rather, it focused on processes for achievement of one precondition assumed necessary for transformative change: the formation of collective agency.

Scholarship has increasingly called for "reframing" as an instrumental process for sustainability transformation (Pahl-Wostl et al. 2007; Leach et al. 2010; Fairbairn 2012). While the connection between reframing, learning and agency has been repeatedly alluded to, there has been little empirical evidence that can be used to document these relationships explicitly (Pahl-Wostl 2006; Mostert et al. 2008; Leach et al. 2010; Lumosi et al. 2019). Our results documented a shift from a framing characterised by external features (i.e., where problems and possible solutions come from outside), to a framing that increasingly placed participants within the system, with newly recognized responsibilities and relationships. Accompanying, and entangled with this

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[14] https://steps-centre.org/blog/creating-bridges-through-the-pathways-to-sustainability-game/

narrative shift was a growing sense of identity among the T-Lab community, built on a shared sense of meaning. This shared meaning was scaffolded through the recognition of the set of concrete capacities that participants possess, their valued relationships and alliances, their particular know-hows, tools, values, beliefs, and interests. We interpret these shifts in narratives to be an expression of a change in the underlying problem framing, from one that externalises responsibility to one that both embeds and enacts responsibilities. This shift may well signal a rise in *internal agency* (Benessaiah and Eakin 2021), increasing the potential for both individual and collective deliberative transformative change. Our work provides grounding for the proposition that collective agency indicates an entanglement of cognitive frames and intentions, while collective action only requires the alignment of actionable goals.

Although relatively little attention to narrative *deconstruction* exists in the literature (Saltelli et al. 2020; Riedy 2021), our results suggest that this process perhaps should be an explicit part of any intervention focused on reframing. Deconstructing narratives occurs when narratives are challenged or 'broken', while participants question their own beliefs or visions aligned with such narrative (Pohl et al. 2010; Robbins 2012; Wittmayer et al. 2019). However, narrative deconstruction requires that new meanings and new opportunities for agency are also created (Riedy 2022). To have such new narratives emerge, it was important in the T-Lab to have trust, personal connections and a sense of shared values: a supportive rather than conflictive and demoralising process. The research team had to step back from controlling what narratives and frames emerged while ensuring that all participants felt comfortable and capable of expressing their ideas. There were different moments along the process where we observed such

deconstruction. First, deconstruction of narratives according to the type and nature of the problem(s) perceived was observed when interactions focused on questioning the deeper causes and barriers for change, and the associated perceived solutions; and implied questioning causal relationships assumed by participants to detect if the supposed causes of certain effects changed. The Q analyses illustrated how the dominant narrative diluted over the process; in Qb no narrative was dominant, suggesting an opening-up and expansion of thought among participants, and an erosion of the dominance of a single narrative. Specific interventions appeared to be particularly useful in narrative deconstruction; for example, exercises that encouraged participants to relate tangible material elements of the system that they valued to deeper intangible meanings and values associated with these elements (Eakin et al. 2019a). Facilitation of reflection on the role and responsibility of agents in the system, and, particularly, activities that led participants to question their assumptions about specific groups (e.g., irregular settlements, *chinamperos*) and their own roles, also appeared to be instrumental in narrative deconstruction. This is consistent with literature on reframing which suggests that activities that ask people to reflect on deeper meanings can be powerful in leading to questioning and reflexivity (Mostert et al. 2008; Pohl et al. 2010; Drimie et al. 2018).

The *construction* of new narratives occurs when narratives are verbalised and expressed in a different manner (Wittmayer et al. 2019), or, more significantly, when new stories begin to emerge. Ideally, in the case of transformative change, in hopeful and empathetic ways. In the T-Lab, the generation of new narratives that was captured in the Q-Methodology and cognitive mapping exercises were likely influenced by ensuring that the T-Lab space-process was not only about discussion and verbalization,

but also about experiencing, doing and affectively relating in new ways within the Xochimilco social-ecological system. As others have noted, affective relations appear to be central to transformative change (Heras and Tàbara 2014; Pelenc et al. 2015; Nightingale et al. 2021). The T-Lab involved diverse exercises: walkshops, creating dioramas of idealised human-wetland settlement, and even a role-playing game that positioned participants as collaborative decision-makers over the wetland's future (see Ruizpalacios et al. 2019 for details). Through these activities, rural-urban dependencies were recognized more explicitly, via activities that were also explicitly eliciting affective responses (Heras and Tàbara 2015; Bentz et al. 2022a). We suspect that it was through this process that participants began to create a new group identity and embrace new narratives.

Enacting new narratives may occur when agents navigate novel situations by engaging effectively within a system (Maiese 2019), and accordingly develop concrete actions or plans by forming different alliances to implement new emerging narratives (van Zwanenberg et al. 2018). Individual and collective agency is a critical element of this process. In the T-Lab, we observed participants finding new understanding of the meanings of the group's capacities, emergent through a recognition of their own "powers" as a way to break down barriers for working together. We also observed participants making new alliances and connections with other participants, and to the material worlds in which they were active, that before the process were not part of their network of possibilities for action. However, the enactment of new narratives was perhaps most evident in the development of new and more alternative collective pathways for change –i.e., when participants co-constructed specific actions, showing evidence of recognition and sharing of

capacities, positionalities and alliances, all crucial elements for enabling collective agency.

The emergence of transformative actions and outcomes with observable impacts on the material condition of the Xochimilco wetland, however, were not (yet) evident when the project finished after more than 2.5 years of collaborative activities. Such outcomes were never the explicit intention of the T-Lab. The mobilisation of collective agency can take many forms, from acceptance of irreversible social-ecological change (and associated losses) to political mobilisation and resistance for restorative interventions. It was evident, however, that the long standing tension over water and land among *chinamperos* and urban residents was likely an obstacle to any constructive social action in Xochimilco.

The lack of understanding –a social 'bridge'– was identified by participants as important to resolve. The dominant framing among the participants prior to the T-Lab was characterised by conflict; the emergent framing from the T-lab emphasised this bridge concept. As the participants themselves noted, the T-Lab created "seeds" for change, rather than change itself. The emergent narrative of the 'bridge' was political, illustrating a possibility for changing discourse of blame to one of possible exchange and collaboration. How such collaboration is realised remains to be seen. Nevertheless, as evident in the agency-nets, several of the participants were 'bridging the divide' through a new social development initiative initiated by one of the participants that targeted disadvantaged residents in the irregular settlements –an interpersonal collaboration that would likely not have taken place prior to the T-Lab. While small in scale, and not aimed at the wetland ecological circumstances *per se*, it illustrates the ways in which small

interpersonal bridges can potentially scale to have wider impacts.

As this research illustrated, there is still a need to measure change as a fundamental aspect of transdisciplinary work. We cannot assume processes and interventions are influential, we have to demonstrate that they are by identifying whether and how interventions can create conditions for change (Schneider et al. 2019). When the actual material outcomes of change in a social-ecological system are still off in the future, the first evidence of transformative potential may be in the formation of collective agency, as a precondition for deliberative collaborative processes (Eakin et al. 2021). Individual and internal transformation in values and meanings is a necessary foundation for collective agency (Vogel and O'Brien 2021). However, these changes are hard to observe and enabling the emergence of evidence takes time. We lack understanding of how specific personalities and individual norms influence the success of processes such as a T-Lab, and what types of exercises or participatory activities were most impactful in the outcomes observed. Conceptualising and capturing a baseline of such social processes is challenging, but necessary to document what happened and what was learned (Ely et al. 2021). Given the significant uncertainty in anticipating when any social change process will coalesce and what outcomes will emerge, attention to process may be far more important than a focus on measuring concrete outcomes at an (arbitrary) moment in time.

As in every participatory process, all participants face the challenge of remaining committed and involved, even after a project 'ends'. The difficulty of this challenge will depend on how meaningful the co-created space is for each participant (Colombetti and Krueger 2015); for this reason, it is important that ownership of the space-process is shared among participants, rather than residing (mostly) with the conveners or facilitators. We observed this emergent sense of ownership in the continued dialogue taking place on WhatsApp, and in the observations made by participants during interviews. But ownership and commitment are also a function of the attitudes and actions of the convenors-researchers. In our case, we recognized a need to be methodologically rebellious to collaborate on the development of a diversity of time-consuming participatory methods while also resisting the need to "finish" the T-Lab with some concrete product, project or outcome. As researchers, we found ourselves questioning our own agency, roles and capacities. Like other participatory action research processes, this one entailed navigating persistent tensions (Chambers et al. 2022). As researchers that were also participants, this meant reflecting on and adapting our hybrid role during the process. While trying to create a space that would enable participants to co-produce objectives and actions (avoiding as much as possible dictating or controlling), at times we also had to distance ourselves from the group to observe and 'measure' potential changes and learning. The constant enacted structure that emerged through the interactions as a group allowed us –the convenors and research team– to also open-up and question our own prejudices and dominant narratives and to explore different framings about the drivers and possible solutions to Xochimilco social-ecological degradation (Eakin et al. 2021).

Our analysis suggests that it is possible to track and collect evidence on processes of social change. Questioning and deconstructing dominant narratives around a problem or situation can lead to a first level of reframing, and thus, initiate other reframing levels, where new insights into roles, relationships and agency (i.e., capacities, interests, meanings, and values) in

relation to the problem domain are explored. In this sense, changes in perception about the system's dynamics (e.g., feedbacks) and about oneself (e.g. re-conceptualization of roles/capacities/self-descriptions and self-construal and a sense of "I can"), can lead to the creation of new meanings and narratives. As a result of the reframing process, we observed not only the emergence of more systemic narratives, but also more empathetic and positively affective narratives, underscoring the importance of affective relations in transformative processes (Siqueiros-García et al. 2022). Nevertheless, our approach was challenging: remarkably time consuming, demanding that a small group of people be willing to invest time and energy, requiring us to loosen control over process, work at different methodological levels, and accept the potential for transient outcomes.

Our work indicates that working towards transformative change may entail an explicit recognition that collective agency is the product of interactions of individuals in terms of social relations as much as changed cognition. It may also demand self-awareness of our positionality, our capacities, and what we value in order to know if and how we have transformed. Subsequently, experiencing alternative ways of acting, and building alliances and novel capacities may be a way of enacting possibilities of action manifested in the new constructed narratives. Altogether, these reframing processes are interlinked and evolve through mutual feedback to create and foster conditions for the emergence of collective agency.

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V. Publicaciones adicionales asociadas

Dado que esta investigación fue parte de un proyecto internacional con una diversidad de colaboraciones en donde se compartían aprendizajes constantemente, se desarrollaron otros productos. Todos los productos se derivaron de los datos que colecté y de los análisis que desarrollé, por lo que emanaron directamente del proceso y los resultados de mi trabajo de investigación. En la Tabla 2 se describen estos productos en co-autoría y su relación específica con esta investigación. Los 20 productos están ordenados por tipo de producto (7 artículos en revistas indizadas; 2 en revistas no indizadas; 5 capítulos de libros; 6 materiales de divulgación), y en orden cronológico; los marcados con un asterisco son los más relevantes para las preguntas de investigación y los objetivos de este trabajo.

Tabla 2. Publicaciones adicionales como co-autora

| Tipo de producto y *link*	Referencia	Extracto de *abstract*/introducción	Contribución y relación con la investigación
1. Artículo científico en revista indizada link	Eakin H, Shelton R, Siqueiros-Garcia J, **Charli-Joseph L**, & Manuel-Navarrete D. 2019. **Loss and social-ecological transformation: pathways of change in Xochimilco, Mexico**. *Ecology and Society* 24(3):15.	*"We analyze narratives about what is valued, what is problematized, and what social and ecological relationships appear as critical from the perspective of contemporary residents and officials. Loss is prominent in these narratives, capturing the interdependence of ecology, identity, meaning, and livelihood for the inhabitants." … "We posit that finding a sustainable pathway forward may depend in part on how residents are able to cognitively or emotionally accommodate landscape change while still enabling the values they have come to associate with the landscape."*	La información utilizada en el segundo enfoque descrito en este artículo emanó directamente de los datos que colecté y analicé. En este artículo, hay una exploración diferente para obtener las diversas narrativas en el área de estudio, y una descripción complementaria del contexto para el caso de estudio de esta investigación.
2. Artículo científico en revista indizada link *	Pereira L, Frantzeskaki N, Hebinck A, **Charli-Joseph L**, Drimie S, Dyer M, Eakin H, Galafassi D, Karpouzoglou T, Marshall F, Moore ML, Olsson P, Siqueiros-García JM, van Zwanenberg P, Vervoort JM. 2020. **Transformative spaces in the making: key lessons from nine cases in the Global**	*"We analyse nine case studies from a previous special issue on Designing Transformative Spaces that aimed to collect examples of cutting-edge action-oriented research on transformations from the Global South. The analysis showed five design phases as being essential: Problem Definition Phase; Operationalisation Phase; Tactical Phase; Outcome Phase; and Reflection Phase. From this synthesis, we distilled five key messages that should be considered when designing research …" "Many researchers are now engaging in transdisciplinary transformations*	Para este artículo, participé en los talleres de los autores, donde discutimos el enfoque para compartir las lecciones a través de los 9 casos de estudio a lo largo de las 5 fases propuestas. Las reflexiones derivan de dichas discusiones colectivas y de mi trabajo de investigación. En este artículo

	South. *Sustainability Science* 15:161–178.	*research, and are finding themselves at the knowledge–action interface contributing to transformative space-making."*	se profundiza sobre el diseño del espacio transformador del caso de estudio.
3. Artículo científico en revista indizada link ∗	Scoones I, Stirling A, Abrol D, Atela J, **Charli-Joseph L**, Eakin H, Ely A, Olsson P, Pereira L, Priya R, & van Zwanenberg P. 2020. **Transformations to sustainability: combining structural, systemic and enabling approaches**. *Current Opinion in Environmental Sustainability* 42:65–75.	*"This article offers a brief overview of different conceptualisations of transformation, and outlines a set of practical principles for effective research and action towards sustainability. We review three approaches to transformations, labelled: 'structural', 'systemic' and 'enabling'. We show how different ways of understanding what we mean by transformations can affect what actions follow. But these approaches are not mutually exclusive. We use an international set of examples on […] wetland conservation and peri-urban development to show how they can be complementary and reinforcing. We describe three cross-cutting practical considerations that must be taken seriously for effective transformations to sustainability: diverse knowledges, plural pathways and the essentially political nature of transformation."*	En este artículo, los resultados de la investigación sobre el caso de estudio específico sirvieron para apoyar la teorización sobre uno de los tres enfoques de transformación (*enabling*) propuestos.
4. Artículo científico en revista indizada link	Ely A, Marin A, **Charli-Joseph L**, Abrol D, Apgar M, Atela J, Ayre B, Byrne R, Choudhary BK, Chengo V, Cremaschi A, Davis R, Desai P, Eakin H, … & Yang L. 2020. **Structured Collaboration Across a Transformative Knowledge Network—Learning Across Disciplines, Cultures and Contexts?**. *Sustainability* 12(6), 2499.	*"This paper reports on an international project that involved transdisciplinary research in six different hubs across the globe and was strategically designed to enable mutual learning and exchange. It draws on surveys, reports and research outputs to analyse the processes of transdisciplinary collaboration for sustainability that took place between 2015–2019. The paper illustrates how the project was structured in order to enable learning across disciplines, cultures and contexts and describes how it also provided for the negotiation of epistemological frameworks and different normative commitments between members across the network."*	Este artículo ofrece una descripción general del proyecto internacional, la experiencia de aprendizaje de la red internacional y brinda algunas particularidades del caso de estudio extraídas de los resultados de esta investigación.
5. Artículo científico en revista indizada link	Chambers JM, Wyborn C, Ryan ME, Reid RS, …. **Charli-Joseph L** …. & Pickering T. 2021. **Six modes of co-production for sustainability**.	*"The promise of co-production to address complex sustainability challenges is compelling. Yet, co-production, the collaborative weaving of research and practice, encompasses diverse aims, terminologies and practices, with poor clarity over*	El caso de estudio de este trabajo formó parte del conjunto de proyectos que inspiraron su desarrollo. La primera autora (J. Chambers)

	Nature Sustainability 4:938-996.	*their implications. To explore this diversity, we systematically mapped differences in how 32 initiatives from 6 continents co-produce diverse outcomes for the sustainable development of ecosystems at local to global scales. We found variation in their purpose for utilizing co-production, understanding of power, approach to politics and pathways to impact. A cluster analysis identified six modes of co-production: (1) researching solutions; (2) empowering voices; (3) brokering power; (4) reframing power; (5) navigating differences and (6) reframing agency."*	me invitó a formar parte de este proceso (respondiendo a un cuestionario y a 2-3 entrevistas semi-estructuradas) para colectar datos particulares de mi proceso de investigación. También contribuí aportando más información sobre la explicación y la justificación del tipo de proceso de co-producción llevado a cabo en la investigación (*reframing agency*).
6. Artículo científico en revista indizada link	Chambers JM, Wyborn C, Klenk NL, Ryan ME, …, **Charli-Joseph L**, …, Rondeau R. 2022. **Co-productive agility and four collaborative pathways to sustainability transformations**. *Global Environmental Change* 72.	*"Co-production, the collaborative weaving of research and practice by diverse societal actors, is argued to play an important role in sustainability transformations. Yet, there is still poor understanding of how to navigate the tensions that emerge in these processes. Through analyzing 32 initiatives worldwide that co-produced knowledge and action to foster sustainable social-ecological relations, we conceptualize 'co-productive agility' as an emergent feature vital for turning tensions into transformations"* *"Co-productive agility opens up multiple pathways to transformation through: (1)* elevating marginalized agendas *in ways that maintain their integrity and broaden struggles for justice; (2)* questioning dominant agendas *by engaging with power in ways that challenge assumptions, (3)* navigating conflicting agendas *to actively transform interlinked paradigms, practices, and structures; (4)* exploring diverse agendas *to foster learning and mutual respect for a plurality of perspectives. We explore six process considerations that vary by these four pathways and provide a*	El caso de estudio de este trabajo formó parte del conjunto de proyectos que inspiraron su desarrollo. La primera autora (J. Chambers) me invitó a formar parte de este proceso (respondiendo a un cuestionario y a 2-3 entrevistas semi-estructuradas) para colectar datos particulares de mi proceso de investigación. También contribuí aportando más información para la exploración de los distintos roles en los procesos de transformación.

		framework to enable agility in sustainability transformations.”	
7. Artículo científico en revista indizada link	Siqueiros-García JM, Manuel-Navarrete D, Eakin H, Mojica L, **Charli-Jospeh L**, Pérez-Belmont P, Ruizpalacios B. 2022. **Sense of agency, affectivity and social-ecological degradation: an enactive and phenomenological approach.** *Frontiers in Psychology* :3548.	*... “Based on our work with farmers from the Xochimilco urban wetland in the southwest of Mexico City, we begin to draw a theoretical approach to address and explain how environmental degradation impacts people's affective life and sense of agency. Farmers who were part of our project referred to a sense of despair and helplessness toward the loss of the ecosystem and their traditional farming-based form of life. From the perspective of phenomenology, enactivism and ecological psychology, we argue that the loss of this form of life in the area is related to the degradation of socio-ecological systems, limiting the opportunities for people to relate meaningfully to others and the environment. We posit that losing meaningful interaction with the environment generates a feeling of loss of control while leading farmers to feel frustrated, anxious and stressed. Such affective conditions have a direct impact on their sense of agency.”*	A partir de ciertos aprendizajes del caso de estudio, este artículo explora más a fondo la relación entre el sentido de agencia y la afectividad.
8. Artículo científico en revista no indizada link	Scoones I, Stirling A, Abrol D, Atela J, **Charli-Joseph L**, Eakin H, Ely A, Olsson P, Pereira L, Priya R, van Zwanenberg P, and Yang L. 2018. **Transformations to Sustainability**. *STEPS Working Paper 104*, Brighton: STEPS Centre.	*“The Sustainable Development Goals (SDGs) highlight how transformations to sustainable economies and societies are a major global challenge. This Working Paper offers a brief overview of different conceptual approaches to transformation, and outlines a set of practical principles for effective research and action towards sustainability. We review three approaches to transformation, labelled: 'structural', 'systemic' and 'enabling'.”*	Este artículo fue el primero en el que exploramos la teorización de los enfoques y marcos de transformación a partir de lo aprendido en la investigación.
9. Artículo científico en revista no indizada link *	Manuel-Navarrete D, **Charli-Joseph L**, Eakin H, & Siqueiros-Garcia JM. 2021. **Applying Technologies of the Self in Transformation Labs to Mobilize Collective**	*“Transformation Laboratories (T-Labs) are human-centered participatory spaces aimed at fostering both the personal development of participants, and the generation of new collective agency in heterogenous groups of actors motivated by the goal of transforming the social-ecological systems they inhabit. T-Labs can benefit from employing*	En este artículo describimos algunas herramientas que co-diseñé y utilicé en el caso de estudio para conceptualizar y promover la agencia colectiva.

	Agency. *Social Innovations Journal*, 5.	*"technologies of the self" (ToS), which are participatory tools to assist self-reflection by drawing people's attention to their own social-ecological agency. Academic researchers can act as convenor/facilitators of T-Labs by playing the dual role of providing both tested ToS for building collective agency, and access to specialized expertise and knowledges, according to the needs of each group."*	
10. Capítulo de libro link * 4 TRANSDISCIPLINARY METHODS AND T-LABS AS TRANSFORMATIVE SPACES FOR INNOVATION IN SOCIAL-ECOLOGICAL SYSTEMS *Laura Pereira, Per Olsson, Lakshmi Charli-Joseph, Olive Zgambo, Nathan Oxley, Patrick Van Zwanenberg, J Mario Siqueiros-García and Adrian Ely*	Pereira L, Olsson P, **Charli-Joseph L**, Zgambo O, Oxley N, Van Zwanenberg P, Siqueiros-García JM & Ely A. 2021. **Transdisciplinary methods and T-Labs as transformative spaces for innovation in social-ecological systems**. En *Transformative Pathways to Sustainability* (pp. 53-64). Routledge.	*"This chapter outlines the theoretical and methodological aspects of the Transformation Laboratories ('T-Labs') approach used throughout the project to bring together multiple researchers, stakeholders and knowledge partners in a coproduction/transdisciplinary research mode to address complex social-ecological problems. This includes a discussion of the early origins of the approach and the evolution of the 'T-Labs' concept throughout the course of the project. It discusses the ways in which different hubs applied the T-Lab approach alongside (or through incorporating) other transdisciplinary, participatory social science methods."*	Este capítulo brinda una explicación de los aspectos teóricos y metodológicos del enfoque de los Laboratorios de Transformación, y de algunos de los métodos utilizados.
11. Capítulo de libro link * 9 WETLANDS UNDER PRESSURE The experience of the Xochimilco T-Lab, Mexico *Hallie Eakin, Lakshmi Charli-Joseph, Rebecca Shelton, Beatriz Ruizpalacios, David Manuel-Navarrete and J. Mario Siqueiros-García*	Eakin H, **Charli-Joseph L**, Shelton R, Ruizpalacios B, Manuel-Navarrete D & Siqueiros-García JM. 2021. **Wetlands under pressure: The experience of the Xochimilco T-Lab, Mexico**. En *Transformative Pathways to Sustainability* (pp. 138-153). Routledge.	*"This chapter provides a chronological and thematic account of the work carried out in Mexico, reflecting on the lessons these experiences bring to sustainability transformations and concepts covered in the earlier chapters. It first provides a historical background to the framing of the problem space and sustainability challenge. It then provides a theory of transformation, drawing widely from the literature and earlier studies highlighting the potential for problem reframing and collective agency. The chapter discusses the ways in which various research methods (e.g. Agency Network Analysis – ANA and Q-Method) were applied. It also describes implementation sequence of the T-*	En este capítulo se profundiza sobre el contexto del caso de estudio y del proceso de investigación.

		Lab process, including the facilitation approaches applied, such as the use of avatars, 3-Horizons-inspired brainstorming, and the "Pathways to Sustainability" game. The chapter reflects on all these processes, discussing the changes that they helped to bring about and pointing to instances in which new collective agency was evident, beyond the conclusion of the project."	
12. Capítulo de libro link * 11 REFRAMING SUSTAINABILITY CHALLENGES Fiona Marshall, Patrick Van Zwanenberg, Hallie Eakin, Lakshmi Charli-Joseph, Adrian Ely, Anabel Marin, and J. Mario Siqueiros-García	Marshall F, Van Zwanenberg P, Eakin H, **Charli-Joseph L**, Ely A, Marin A & Siqueiros-García JM. 2021. **Reframing sustainability challenges**. En *Transformative Pathways to Sustainability* (pp. 187-205). Routledge.	*"'Framing' is a key concept in the pathways approach which was developed and applied in the design and implementation of the project. This chapter draws on various hub case studies and explains how each of them contributes to our understanding of reframing as an element of transformations to sustainability. Referring specifically to the Argentina, Mexico and UK case studies, the chapter discusses how each of the T-lab processes helped to reframe understandings of the systems under investigation and their associated problems, reframe the values and meanings associated with those systems and reframe the solutions to the sustainability challenges that had been identified. The chapter discusses the interactions between reframing, alliance building and innovation and concludes by considering how cognitive lock-ins that resist transformative change can themselves be addressed by reframing processes."*	Este capítulo ofrece una teorización y descripción del significado del encuadre y reencuadre en los procesos de Laboratorios de Transformación.
13. Capítulo de libro link	Ely A, Marin A, Marshall F, Apgar M, Eakin H, Pereira L, **Charli-Joseph L**, Siqueiros-García JM, Yang L, Chengo V & Abrol D. **Emerging insights and lessons for the future.** En *Transformative Pathways to Sustainability* (pp. 206-232). Routledge.	*"This concluding chapter summarises the key findings of the 'Pathways' transformative knowledge network (TKN), its contributions to the 'sustainability transformations' literature and the lessons and implications for internationally networked, transdisciplinary research projects in the future." "The chapter provides a deeper understanding of 'transformative pathways to sustainability' and the role that science and research can play in fostering them, not only*	En este capítulo se describen las lecciones aprendidas en los seis nodos y en el proceso general del proyecto internacional.

		through formal research outputs but also the tacit and experiential knowledge and the relationships that they can foster."	
14. Capítulo de libro link	Drimie S, Magner C, Pereira L, **Charli-Joseph L**, Moore ML, Olsson P, Siqueiros-Garcia, JM & Zgambo O. 2021. **Facilitated dialogues**. En *The Routledge Handbook of Research Methods for Social-Ecological Systems* (Eds. Biggs R, de Vos A, Preiser R, Clements H, Maciejewski K and Schlüter M). (pp. 136-147) (2021):526, Routledge.	*"Chapter 9 deals with facilitated dialogue methods, including a suite of facilitated processes that seek to generate social-ecological innovations aimed at challenging and changing existing roles and routines, power dynamics, relations among groups and networks, resource flows, as well as meaning and values (and culture) across different contexts and scales. The chapter discusses appreciative enquiry, change labs, social innovation labs, the circle, Theory U, T-Labs, scenarios, world cafés, learning journeys, listening projects and dialogue interviewing. It goes on to discuss the types of social-ecological systems (SES) problems and research questions commonly addressed by this set of methods, as well as their limitations, resource implications and new emerging research directions."*	Este capítulo brinda una explicación de la importancia de facilitar procesos de diálogo en los sistemas socio-ecológicos.
15. Material de divulgación - Viñeta de métodos link *	Agency Network Analysis (ANA), STEPS Centre website. Siqueiros-García JM & **Charli-Joseph L.** - National Autonomous University of Mexico (UNAM), in collaboration with the North American Hub of the Pathways Network.	*"ANA was developed for researchers to better understand the agency of specific actors in a socio-ecological system (SES) prior to the implementation of a Transformation Lab (T-lab)." "The T-lab, which comprises workshops and research conducted over a 3-year period starting in 2016, was designed to approach a 'wicked' sustainability problem through transforming individual and collective agency within the SES. It was therefore important to understand the kind of agency that would be brought into the action arena of the T-Lab."*	Este blog fue uno de los primeros textos en los que escribí (junto con J.M. Siqueiros) sobre el Análisis de Redes de Agencia.
16. Material de divulgación - Guía link	Pathways Network. 2018. T-Labs: A Practical Guide - Using Transformation Labs (T-Labs) for innovation in social-ecological systems.	*"The ESRC STEPS Centre and its partners have published a new guide to T-Labs (Transformation Labs). The 40-page guide draws on lessons from the Pathways Network, a project investigating new approaches for transformations to sustainability. Since 2016, the Pathways Network has convened T-Labs to respond to social-ecological problems in six*	La contribución principal en esta guía aparece en la sección - *Mexico: Harnessing agency for change*

17. Material de divulgación - Guía link *	Ruizpalacios B, **Charli-Joseph L**, Eakin H, Siqueiros-García JM, Manuel-Navarrete D, Shelton R. 2019. **El Laboratorio de Transformación en el Sistema Socio-Ecológico de Xochimilco, Ciudad de México: Narrativa del proceso y guía metodológica**. Ciudad de México, México: LANCIS-IE, UNAM	*"Las actividades que se describen en esta guía están diseñadas para apoyar la investigación participativa en la búsqueda de vías sostenibles hacia la transformación de los sistemas socio-ecológicos. Esta guía ofrece actividades y ejemplos prácticos para explorar de manera creativa, nuevas formas de relación de los participantes entre ellos y con su entorno. El proceso de un Laboratorio de Transformación tiene una estructura poco convencional pues las actividades no siguen el diseño tradicional de análisis de problemas y planeación de soluciones. Lo que busca, en cambio, es explorar las percepciones y experiencias de los individuos a través del diálogo continuo, para explorar formas de conectar sus mundos y perspectivas. Las actividades que integran este compendio, por lo tanto, permiten vincular lo personal con lo colectivo de manera gradual y creativa."*	Esta guía representó un elemento muy importante para nuestro proceso ya que ilustra las diferentes herramientas y métodos aplicados, y fue diseñado para las y los participantes de la investigación. Diseñé su contenido y la escribí (principalmente junto con B. Ruizpalacios).
18. Material de divulgación - Blog link	Eakin H., **Charli-Joseph L.** & Siqueiros-García J.M. 2017. **What 'Agency' do researchers have in transformative research projects?** North America Hub - *Pathways Network* - STEPS Centre. Nov. 22, 2017.	*"In our PATHWAYS network case in Xochimilco, Mexico City, we are exploring whether people can have 'agency' to make a difference to very complex socio-ecological problems. Xochimilco is a degraded but very culturally, ecologically and economically meaningful wetland system in the south of Mexico City. In a recent project workshop, we turned our attention on to ourselves. Given our focus on 'agency', what can we say about our own agency as researchers involved in what we hope will be transformative research?"*	En este blog hablamos del sentido de la agencia de los investigadores en este tipo de esfuerzos.
19. Material de divulgación - Blog	Ruizpalacios B., **Charli-Joseph L.**, Eakin H, Siqueiros-García JM, Shelton R. 2017. **Creating bridges in Xochimilco**	*"As part of our T-lab in the Pathways Network, the North America Hub designed a Pathways to Sustainability Game. The game aimed to offer a safe space for participants to explore decision-making in*	En este blog explicamos un juego que junto con J.M. Siqueiros desarrollamos para

*	through the **"Pathways to Sustainability Game"**. North America Hub - *Pathways Network* - STEPS Centre. Oct. 29, 2018.	*both favorable and adverse contexts, while recognizing and challenging each other's positions. The game was designed for participants to grapple with the very concept of 'pathways' – the idea that movement towards sustainability is a process of constructing alternatives and making decisions, while reflecting on how the system looks, and hence learning from every action taken – and the role of uncertainty in navigating such pathways."*	una interacción grupal específica.
20. Material de divulgación - Video *	Eakin H, **Charli-Joseph L**, Ruizpalacios B, Siqueiros-García JM, Shelton R, Manuel-Navarrete D. 2019. **Del desarraigo al arraigo, y de las trampas a la transformación: Voces de Xochimilco**. North America Hub - Pathways Network - STEPS Centre.	*"Este video es una introducción visual al barrio y humedal de Xochimilco, Cd. de México, contada por un grupo de personas que comparten una conexión con este sistema. Cada una de ellas da su punto de vista sobre las transformaciones que están teniendo lugar en la región, incluyendo sus preocupaciones y esperanzas para el futuro."*	A partir de lo aprendido a lo largo del proceso, junto con H. Eakin y R. Shelton, co-diseñamos el guión y las preguntas para los participantes.

Por Fede Contreras, participante del T-Lab

VI. Discusión

Recapitulación de la investigación

Como se muestra en el capítulo I y se desarrolla en el capítulo II, la pregunta de investigación central de este trabajo fue *¿Cómo la teoría sobre transformaciones se puede operacionalizar a través de intervenciones transdisciplinarias diseñadas para fomentar agencia colectiva?* A partir de esta pregunta de investigación general, tres preguntas de investigación específicas guiaron la investigación: 1) *¿Cómo la identificación y el reconocimiento de la agencia individual pudiera apoyar la emergencia de la agencia colectiva?*; 2) *¿Cómo los agentes perciben sus roles en las dinámicas del sistema socio-ecológico, y cómo esta percepción cambia mientras su noción de agencia evoluciona?*; y 3) *¿Qué actividades y procesos podrían producir cambios observables en la agencia individual y colectiva?* A partir de estas preguntas, la hipótesis central fue que la agencia colectiva pudiera lograrse a través de la creación de un espacio donde se den procesos de reencuadre del sistema y reflexión sobre las capacidades individuales y del grupo; y dichos procesos podrían facilitar la emergencia de valores compartidos que, a su vez, fomenten la consolidación de una identidad y eventualmente, activen los mecanismos para interactuar con el sistema socio-ecológico y para explorar trayectorias novedosas. En consecuencia, a través de esta investigación diseñé actividades para la reflexividad, el reencuadre de los problemas y el reconocimiento de las capacidades, con el fin de probar si las condiciones proporcionadas podrían fomentar un creciente sentido de agencia. Esta discusión está estructurada de acuerdo con las preguntas de investigación.

Explorando cómo operacionalizar la teoría sobre las transformaciones para fomentar agencia

Si bien existe cada vez mayor acuerdo sobre el papel fundamental que desempeña la agencia para fomentar procesos de transformación (e.g., Westley et al. 2011, 2013; Moore et al. 2014; Pesch 2015), sigue habiendo un vacío empírico y metodológico en los criterios y métodos que contribuyen a cómo identificar y promover la agencia para mejorar el potencial de las intervenciones novedosas en los retos de sostenibilidad (e.g., Leach et al. 2012; Abson et al. 2017; Tschakert et al. 2016), en particular en el diseño de espacios transformadores (Pereira et al. 2015). Aunque se han hecho muchos llamados al cambio transformador ante los importantes retos de sostenibilidad a los que se enfrentan actualmente los distintos grupos, el "cómo" de la transformación ha recibido menos atención (Scoones et al. 2020; Bentz et al. 2022b; Ojha et al. 2022). No obstante, la creación de significados compartidos y la agencia colectiva se consideran ingredientes fundamentales en las trayectorias de transformación (Chambers et al. 2022; Riedy 2022). En esta investigación se estudió cómo ciertos procesos podrían lograr una condición previa que se supone necesaria para el cambio transformador: la formación de la agencia colectiva. La investigación postuló que la agencia colectiva surge de las intenciones, perspectivas, valores e

interacciones de individuos únicos embebidos y permeados por un entorno social, político y cultural, destacando así la importancia de comprender los mecanismos de reencuadre que pueden contribuir a fomentar la agencia.

A lo largo de esta investigación, un agente fue retratado como un individuo que ha construido y encarna un conjunto de valores y normas socialmente compartidos que dan forma a su enfoque único y subjetivo de la vida, que a su vez constituyen su motivación para la acción y definen el significado de actuar por sí mismo(a). Con el fin de conectar la agencia individual con el potencial surgimiento de la agencia colectiva, la investigación diseñó intervenciones que: a) identificaron y describieron los tipos de agentes de cambio en un contexto o sistema específico; b) identificaron diferentes narrativas de un sistema socio-ecológico desde la perspectiva de los agentes; c) identificaron el espacio de acción de los agentes y la redundancia o las brechas en sus esfuerzos de acción; y, d) desarrollaron tanto una línea base a partir de la cual se podría observar el cambio potencial, como un insumo para el diseño de un espacio transformador destinado a generar la agencia colectiva al someterse a un proceso de reencuadre. Para ello, se propuso que cuando los marcos de un grupo se cambian a través de un proceso participativo intencional, como un T-Lab, la agencia colectiva del grupo también puede verse afectada. Por lo tanto, el proceso de reencuadre implicó participar en actividades diseñadas intencionadamente para ayudar a reposicionar a los agentes y conectarlos con otros agentes y con el entorno de formas previamente inexploradas.

El sentido de agencia puede aumentar o disminuir a lo largo de la vida de una persona mediante procesos de interacción dinámica y acoplada con el entorno socio-ecológico y cultural (Laland & O'Brien 2011). Por lo tanto, en esta investigación la agencia se conceptualizó en estos términos para enfatizar que es emergente de un proceso de transformación mutua entre el individuo y su entorno, las redes sociales y la cultura. Esta comprensión de la agencia asume que un agente es siempre un individuo situado en un contexto definido, y que este contexto da forma y es moldeado por el individuo a través de sus prácticas e interacciones (Scoones et al. 2020). Para construir la agencia es necesario propiciar condiciones que fomenten una interacción iterativa de lo individual y lo colectivo para crear un espacio que permita su emergencia en ambos niveles (O'Brien & Sygna 2013; Pesch 2015). Dado que el proyecto duró casi 3 años, y esto podría percibirse como un tiempo muy corto en la vida, algunos podrían cuestionar que no es suficiente para observar un cambio en la agencia. Sin embargo, esta investigación demostró que si las interacciones son lo suficientemente significativas como para embarcarse en procesos de auto-reflexión en los que el sentido de la agencia en sí mismo se convierte en objeto de reflexión, pueden revelarse formas alternativas de involucrarse en un sistema, lo que permite transformarlo desde dentro.

En respuesta a las numerosas preocupaciones expresadas en la literatura sobre desarrollo participativo (e.g., Whitehead and Gray-Molina 1999; Kothari 2001; Williams 2004), esta investigación demostró el valor de llevar a cabo un trabajo a nivel individual antes de cualquier proceso colectivo destinado a fomentar la acción transformadora. Para crear las posibilidades de los espacios y procesos emancipatorios, y el potencial de la agencia y el cambio, es necesario

comprometerse con los individuos y sus aspiraciones y valores (Brown & Westaway 2011; Walker 2018) antes de participar en cualquier proceso colectivo que podría exacerbar o reproducir involuntariamente las dinámicas de poder social existentes, o silenciar voces particulares. El enfoque seguido en el T-Lab permitió captar múltiples puntos de vista egocéntricos sobre un sistema, y proporcionó una serie de objetos de frontera (i.e., representaciones materiales) que reflejaban, aunque de forma abstracta, la realidad social y ecológica de los participantes de una forma novedosa. Al captar el mundo y la visión de éste de cada participante de forma independiente, se pretendía garantizar que todas las voces con las que se trabajaba estuvieran representadas de la forma más completa y precisa posible. Las acciones, creencias y capacidades de algunos individuos habrían quedado inevitablemente ocultas si se hubieran limitado a participar en un proceso colectivo sin haber tenido la oportunidad de reflexionar sobre su agencia individual. Como se reconoce cada vez más en la literatura (Manuel-Navarrete & Buzinde 2010; O'Brien 2012; O'Brien & Sygna 2013; Pelling et al. 2015), la transformación del sistema debe tener sus raíces en el cambio cognitivo y psicológico, por lo que los enfoques de diseño transformador deben involucrar lo personal y vincular explícitamente los perfiles personales con el sistema socio-ecológico. En consecuencia, la información de los participantes, como agentes, es la base para crear un espacio cognitiva y emocionalmente significativo (Maiese 2019).

Como se mencionó anteriormente, el desarrollo de un mayor sentido de agencia (individual y colectivo) es un proceso que está conformado por diversos factores (i.e., las interacciones con otros actores sociales, la cultura, el contexto socio-político, etc.). Así, aunque esta investigación las 'separa', la agencia individual y la colectiva son dos procesos interdependientes (es decir, un mayor sentido de la agencia individual podría surgir al percibir cómo se desarrolla la agencia colectiva). Por lo tanto, el surgimiento de la agencia no es un proceso lineal, con un nivel y luego el otro. Desde este punto de vista, la separación de la agencia individual y la colectiva es quizá artificial, ya que se trata de un bucle de retroalimentación en el que ambos tipos de agencia están interrelacionados. Sin embargo, como uno de los principales objetivos de esta investigación era explorar cómo ciertas herramientas y métodos podían ayudar tanto a identificar como a fomentar la agencia, esta separación fue útil en términos operativos. Dado que el grupo era pequeño y bastante singular, sería necesario seguir probando e implementando el enfoque propuesto para concluir con observaciones más generalizables.

Otros trabajos relacionados sugieren que la degradación socio-ambiental puede conducir a una disminución del sentido de agencia, porque los estados afectivos impactan en el sentido de "puedo hacer" o "no puedo hacer" (e.g., Krueger & Colombetti, 2018; Eakin et al. 2019a; Siqueiros-García et al. 2022). Por lo tanto, trabajos futuros sobre agencia podrían considerar centrarse más explícitamente en cómo podría promoverse la agencia mediante el diseño de procesos centrados en enfoques relacionales que ayuden a comprender en mayor profundidad las motivaciones que subyacen a cómo y por qué actúan las personas (Hochachka 2020), y quizás más importante, en por qué las personas no quieren actuar o cambiar (i.e., desmotivación, depresión, desesperanza, ansiedad, etc.). Por lo tanto, es necesario seguir investigando para comprender cómo la experiencia

personal (estado de ánimo, actitudes, mentalidad, etc.) está relacionada con la propia agencia individual, pero también con la colectiva, y viceversa.

Profundizando en los procesos de reencuadre para habilitar la agencia

Diversos discursos conocidos de las ciencias de la sostenibilidad abogan por trascender la noción de seguir analizando los problemas para pasar a esfuerzos más relacionados con la acción (e.g., Clark 2007; Lang et al. 2012; Wiek et al. 2012). Sin embargo, esta investigación hizo hincapié en que, en lugar de analizar los problemas o las situaciones dentro de los marcos o conceptualizaciones existentes, en algunos contextos como este podría ser necesario reencuadrar primero los problemas o las situaciones para posteriormente 'abrir' y explorar vías de acción que aún no eran evidentes.

Si bien se ha aludido en repetidas ocasiones a la conexión entre el reencuadre, el aprendizaje y la agencia, hay poca evidencia empírica que pueda utilizarse para documentar explícitamente estas relaciones (Pahl-Wostl 2006; Mostert et al. 2008; Leach et al. 2010; Lumosi et al. 2019). Sin embargo, los procesos de reencuadre son fundamentales para idear nuevas trayectorias hacia la sostenibilidad que tengan el potencial de ser transformadoras (Pahl-Wostl et al. 2007; Leach et al. 2010; Fairbairn 2012).

Al inicio de esta investigación, la noción de reencuadre se relacionó principalmente con la exploración de los significados a través de cuatro aspectos: a) separar los significados de su soporte material (separar el significado de sus significantes *sensu* De Saussure (1916), b) cuestionar las narrativas reflejadas en la red de significados, c) crear nuevas conexiones entre los significados, y d) encontrar un nuevo soporte material para esos significados. Estos cuatro 'pasos' se propusieron para sentar las bases con el fin de romper potencialmente las restricciones cognitivas que han limitado las soluciones y ayudar a identificar las barreras ecológicas, sociales, políticas y/o culturales, ya que las soluciones anteriores se habían centrado en preservar la materialidad específica que encarna lo significativo en lugar de su significado inmaterial. Sin embargo, a medida que el proyecto evolucionaba y surgían nuevas ideas empíricas y teóricas, también evolucionó la noción de posibilitar procesos de reencuadre. Dicho proceso implicaba desafiar constantemente las narrativas dominantes sobre el sistema (Marshall et al. 2021), pero también las narrativas dominantes emergentes dentro del grupo. Los desafíos asociados a estas narrativas implicaban también cuestionar su potencial poder transformador. El proceso de reencuadre evolucionó a medida que los participantes desvinculaban los significados y las emociones de su soporte material para retener los primeros independientemente del estado y su realización real en el segundo (es decir, desvinculando los significados y el valor asociados a una chinampa de la chinampa física-geográfica).

Estos cambios en las narrativas se interpretaron en esta investigación como una expresión de un cambio en el marco del problema subyacente, de uno que externaliza la responsabilidad a uno que incorpora y enactúa responsabilidades. Este cambio pudiera señalar un aumento de la agencia interna (Benessaiah & Eakin 2021), aumentando el potencial de cambio transformador deliberado tanto individual como colectivo. Acompañando a estos cambios, hubo un creciente sentido de identidad entre el grupo del T-Lab. Como mostraron ciertos de los últimos testimonios, algunos participantes consideraron que el proceso fue útil para fomentar la unión entre el grupo, y sintieron que el grupo tenía una identidad propia, construida sobre un sentido compartido de la conexión de los participantes entre sí. Este significado compartido se afianzó mediante el reconocimiento del conjunto de capacidades concretas que poseen los participantes, sus relaciones significativas y alianzas, sus conocimientos prácticos particulares, sus herramientas, sus valores, sus creencias y sus intereses.

Barreras para el cambio y evidencia de acciones transformadoras

El proceso de identificación de las barreras para lograr las trayectorias de cambio propuestas por el grupo fue fundamental, pero uno de los ejercicios más difíciles. La identificación de dichas barreras -aquellas condiciones y mecanismos que dificultan el cambio (ej., los incentivos negativos a través de programas gubernamentales que apoyan prácticas agrícolas no sostenibles), se realizó principalmente a través de un formato de conversación grupal facilitada. La mayoría de los participantes se abrieron al grupo y explicaron las razones profundas que creían que eran las causas de la degradación del sistema de Xochimilco. La mayoría de estas barreras estaban relacionadas con obstáculos psicológicos como la baja autoestima, la depresión, la desmoralización, la imagen socialmente devaluada de los productores agrícolas de Xochimilco, y la ausencia de cohesión social y solidaridad entre ellos. Este cambio de enfoque de barreras externas a internas fue indicativo de que el proceso de desvinculación y reencuadre tuvo un impacto en términos de romper las restricciones cognitivas. El cambio de los participantes de pensar en las limitaciones internas contribuye a la noción de la importancia de discernir entre los 'límites' (absolutos estructurales, imposibles de superar) principalmente de la literatura de adaptación (i.e., Moser & Ekstrom 2010), y las 'barreras' (que pueden ser superadas si se discuten y entienden, i.e., Piggott-McKellar et al. 2019).

Sin embargo, el surgimiento de acciones y resultados transformadores con impactos observables en la condición material del humedal de Xochimilco no fueron (al menos no aún) evidentes cuando el proyecto terminó después de casi 3 años de actividades de colaboración. Dichos resultados nunca fueron la intención explícita del T-Lab, ya que no se pretendía que diera lugar a ninguna trayectoria específica de cambio o resultado transformador. La movilización de la agencia colectiva puede adoptar muchas formas, desde la aceptación de un cambio socio-ecológico irreversible (y las pérdidas asociadas) hasta la movilización política y la resistencia a las intervenciones restauradoras. Sin embargo, fue evidente que la histórica tensión sobre el agua y la

tierra entre los chinamperos y los residentes urbanos es probablemente un obstáculo para cualquier acción social constructiva en Xochimilco.

Dicha falta de entendimiento –la ausencia de un 'puente' social– fue identificada por los participantes como importante a resolver. El marco dominante entre los participantes antes del T-Lab se caracterizaba por el conflicto; el marco emergente del T-Lab hizo hincapié en este concepto de puente. Como señalaron los propios participantes, el T-Lab creó 'semillas' para el cambio, más que el cambio en sí mismo. La narrativa emergente del 'puente' era política e ilustraba la posibilidad de cambiar el discurso de la culpa por uno de posible intercambio y colaboración. Queda por ver cómo se materializa dicha colaboración. No obstante, tal y como se desprende de las redes de agencia, varios de los participantes estaban 'tendiendo un puente' a través de una nueva iniciativa de desarrollo social iniciada por uno de los participantes y dirigida a los residentes desfavorecidos de los asentamientos irregulares, una colaboración interpersonal que probablemente no habría tenido lugar antes del T-Lab. Aunque a pequeña escala, y no dirigida a las circunstancias ecológicas de los humedales en sí, ilustra las formas en que los pequeños puentes interpersonales pueden potencialmente tener impactos más amplios.

Navegando roles y espacios para el involucramiento

Si bien la lógica detrás del diseño para identificar a los agentes fue útil para justificar las razones específicas para involucrar a ciertos participantes en lugar de otros, la permanencia de los participantes a lo largo de un proceso de casi 3 años fue un reto. A medida que el proceso evolucionaba, los participantes más 'externos' –considerados como un apoyo para la creación de alianzas– parecían no ser útiles para el objetivo central de permitir conexiones más profundas entre los participantes implicados en el proceso de reencuadre. Aunque evidentemente algunos participantes se mantuvieron más comprometidos que otros, independientemente de su agrupación inicial, y aunque la mayoría de los individuos que participaron en el grupo central permanecieron, quién continúa en un proceso es independiente de su papel potencial pre-identificado y artificial. Por lo tanto, esta cuidadosa selección inicial de los participantes en función de roles específicos fue menos importante de lo que se pensó inicialmente. Si bien el conjunto de criterios utilizados para identificar e invitar a los participantes a un proceso, siempre adaptados a las condiciones específicas y al contexto en el que está inmerso un proyecto (Schneider & Buser 2018), podría ser útil para procesos participativos similares, únicamente ciertos criterios fueron especialmente significativos para esta investigación (tales como la capacidad y la voluntad de experimentar con diferentes enfoques; y la solidaridad y la empatía con respecto a los demás). Por lo tanto, posiblemente una mejor manera de abordar la participación en un T-Lab sería tener una diversidad de actores con diferentes posiciones epistemológicas y diversos tipos de conocimiento, pero todos con un compromiso inicial con el proceso de tipo más 'abierto'.

Dado que el proceso de reencuadre implicó la identificación y el cuestionamiento colectivo de las narrativas de los agentes, como ventanas para acceder a sus marcos sobre la comprensión de sus posiciones, roles y formas de interpretar el sistema, no todos los participantes tenían la misma disposición y apertura para ser desafiados. Además, si bien es esencial involucrarse con individuos que contribuyen a una determinada configuración de grupo que promueva tanto la voluntad de comprometerse como de impulsar un proceso transformador, también podría ser fundamental involucrar a participantes que sean capaces de 'interrumpir' o ayudar a cuestionar colectivamente los bloqueos cognitivos y afectivos estancados. Las diversas interacciones posibles que pueden tener lugar entre los participantes son fundamentales para los procesos transdisciplinarios, ya que la naturaleza y la evolución de dichas relaciones conforman y determinan la voluntad de apoyar y dirigir un proceso, y esto no puede diseñarse ni controlarse –y nada relacionado con el involucramiento de agentes de cambio que cumplan dichos criterios podría evitarlo. Al igual que otros procesos de investigación-acción participativa, éste implicó navegar a través de tensiones persistentes (Chambers et al. 2022). Estas tensiones abarcaron desde poder discutir tensiones históricas (ej., sobre la tenencia de la tierra y el uso del agua entre los chinamperos y los residentes de los asentamientos irregulares) mientras se mantenía una atmósfera respetuosa y se fomentaba el compromiso de los participantes a lo largo de las diferentes actividades, hasta ser capaces de mantener interacciones atractivas e interesantes para todos los involucrados.

Como investigadores que también éramos participantes, esto significó reflexionar y adaptar nuestro papel híbrido durante el proceso. Mientras intentábamos crear un espacio que permitiera a los participantes co-producir objetivos y acciones (evitando en lo posible dictar o controlar), a veces también teníamos que distanciarnos del grupo para observar y 'medir' los posibles cambios y aprendizajes. Como coordinadora y enlace principal con el proyecto, me sentí personalmente muy afortunada de formar parte de este equipo de investigación-facilitación: un equipo único que había trabajado previamente en conjunto y que había construido relaciones de confianza durante algún tiempo, un equipo que se comprometió a ser lo más abierto, creativo y sincero posible en cada interacción. No obstante, este proyecto supuso salir de nuestra zona de confort para experimentar con enfoques participativos alternativos y formar parte de un grupo en el que la personalidad de algunos de los participantes les permitió enfrentarse a este tipo de proceso abierto, abstracto, y a veces caótico. Y quizás, en cierta medida, la capacidad de los participantes para comprometerse con el proceso se vio influida por la naturaleza de nuestro equipo de investigación-facilitación. En consecuencia, esto también implicó cuestionar mi propia agencia (es decir, cómo cambiaron mi posicionalidad, rol, y capacidades) para convocar y facilitar dicho proceso.

Articulación de métodos en un espacio-proceso transformativo

Los métodos descritos en esta investigación se desplegaron, en primer lugar, con el objetivo de identificar el lugar del individuo en los procesos de transformación del sistema más amplio. Por lo tanto, las actividades se diseñaron para dilucidar las perspectivas, valores y prácticas personales y

compartidas, así como las narrativas comunes que relacionan al individuo con los procesos sociales y políticos que impulsan la dinámica del sistema. El enfoque metodológico de las fases iniciales del proyecto fue decisivo para identificar la agencia individual y sentar las bases sobre las que construir la agencia colectiva, reconociendo los valores y significados compartidos en torno a los cuales se pueden diseñar posibles intervenciones transformadoras. Examinar los propios valores y creencias a través de actividades encarnadas puede promover una comprensión más profunda de cómo estos dan forma a las prácticas y a las dinámicas socio-políticas (Bentz et al. 2022). Al tener acceso a los temas que los participantes valoran más, se puede tener un indicador de lo que los participantes creen que es bueno o malo para el sistema. Esto implica que la agencia colectiva puede no ser tanto una cuestión de objetivos compartidos, sino más bien de significados y valores compartidos (i.e., Bentz et al. 2022; O'Brien 2021). Esta información proporciona a todos los implicados un marco más transparente a través del cual pueden tomar decisiones significativas alineadas con lo que implica la transformación hacia la sostenibilidad para su contexto. A su vez, este conocimiento puede orientar posibles nuevas acciones colectivas a través de mecanismos desarrollados por los agentes que pueden constituir un espacio de acción transformado. Aunque algunas de las herramientas metodológicas utilizadas para este proyecto no son nuevas, la intención era emplearlas y articularlas de forma novedosa para captar las diferentes facetas de los agentes potencialmente transformadores.

Sin embargo, aunque los métodos desplegados al principio del proyecto fueron diseñados para caracterizar las propiedades a nivel individual, los métodos diseñados para vincular las propiedades de un agente hasta el nivel de un grupo implicaron un esfuerzo más complejo. Estos métodos fueron diseñados para ser implementados en las interacciones grupales para cultivar las relaciones sociales entre los participantes y alrededor del humedal de Xochimilco con el objetivo final de fomentar la creación de la agencia colectiva. Para ello, la hipótesis era que las interacciones a lo largo del T-Lab debían crear un espacio en el que los agentes, como grupo, pudieran reencuadrar la forma en que conceptualizan el SSE, su posición en él, sus interacciones con los demás y con el sistema, todo ello en función de lo que es valioso para ellos sobre el SSE. A medida que los agentes interactuaban y trabajaban juntos, el proceso de reencuadre construía relaciones sociales significativas, al menos en algunos participantes, como mostraron los resultados. Las relaciones significativas surgen de los agentes que reconocen valores compartidos, sinergias e incluso discordancias. Dado que los marcos son para y sobre cosas que le importan a alguien, también están embebidos de afectividad. En el T-Lab, la generación de nuevas narrativas capturadas en la Metodología Q y los ejercicios de mapeo cognitivo fueron probablemente influenciados por asegurar que el espacio-proceso del T-Lab no era sólo acerca de la discusión y la verbalización, sino también acerca de experimentar, hacer y relacionarse afectivamente en nuevas formas dentro del sistema socio-ecológico de Xochimilco. Como otros han señalado, las relaciones afectivas parecen ser fundamentales para el cambio transformador (Heras & Tàbara 2014; Pelenc et al. 2015; Nightingale et al. 2022).

Como se explicó, el grupo del T-Lab estuvo compuesto por ciertos individuos que fueron seleccionados con base en criterios específicos. Aunque esto puede haber implicado un "sesgo de selección", ello fue especialmente importante para ver si las interacciones diseñadas, en un contexto concreto, podían contribuir a posibilitar la agencia colectiva (más allá de aquellos participantes predispuestos a tal esfuerzo). Sin embargo, aún quedan cuestiones pendientes en cuanto a la aplicación de estos métodos en otro tipo de contextos -por ejemplo, uno en el que no se pueda seleccionar a los participantes- para evaluar si estos métodos podrían tener el mismo impacto. Por lo tanto, el trabajo adicional implicaría explorar si este enfoque podría funcionar mejor específicamente en contextos como el de Xochimilco, cuando hay un fuerte deseo de cambio que se ha articulado en una variedad de esfuerzos (frustrados) a lo largo del tiempo, pero también una ausencia de un fuerte esfuerzo organizado a través de diversos actores, y por lo tanto un sentido de agencia que parece estar disminuido.

Múltiples esfuerzos para promover transformaciones deliberadas se han llevado a cabo durante un largo período en Latinoamérica y otras partes del mundo. Diversas experiencias de aprendizaje vinculadas principalmente a la Investigación Acción Participativa y a la Educación Popular (Fals-Borda 1987; Núñez-Hurtado 2005; Merçon 2018) han sido inspiradoras para muchos profesionales involucrados en las transformaciones. A través del apoyo a las luchas por formas más democráticas y plurales de conocer y ser, los enfoques radicales y activistas de las transformaciones (Temper et al. 2018) también han demostrado ser fundamentales para 'romper' diferentes tipos de barreras y permitir cambios más profundos. Admiro y reconozco estos esfuerzos, en los que es muy probable que se produzcan implícitamente eventos de reencuadre. Sin embargo, rara vez se identifican explícitamente como procesos que fomentan agencia. Esta investigación contribuye a documentar explícitamente cómo ciertas condiciones y mecanismos podrían deconstruir, construir y enactuar diversas narrativas para fomentar el surgimiento de la agencia colectiva.

Como se ilustra en esta investigación, sigue existiendo la necesidad de medir el cambio como un aspecto fundamental en el trabajo transdisciplinario. No se puede dar por sentado que los procesos y las intervenciones son influyentes, se tiene que demostrar que lo son identificando si las intervenciones pueden crear condiciones para el cambio y cómo lo hacen. Cuando los resultados materiales del cambio en un sistema socio-ecológico se manifiestan en un futuro lejano, la primera evidencia del potencial transformador puede estar en la formación de la agencia colectiva, como condición previa para los procesos de colaboración deliberados. La transformación individual e interna de los valores y significados es una base necesaria para la agencia colectiva (Vogel & O'Brien 2021). Sin embargo, estos cambios son difíciles de observar y posibilitar que emerja evidencia lleva tiempo. Por lo tanto, falta comprender mejor cómo influyen las personalidades específicas y las normas individuales en el éxito de procesos como un T-Lab, y qué tipos de ejercicios o actividades participativas tuvieron más impacto en los resultados observados. Conceptualizar y capturar una línea base de tales procesos sociales es un reto, pero es necesario para documentar lo que sucedió y lo que se aprendió. Dada la gran incertidumbre que existe cuando se anticipa el momento en que cualquier proceso de cambio social confluye y qué resultados

surgirán, colocar la atención en el proceso puede ser mucho más importante que centrarse en la medición de resultados concretos en un momento (arbitrario) en el tiempo (Vilsmaier et al. 2020).

Los análisis sugieren que es posible rastrear y recopilar evidencia sobre procesos de cambio social. El cuestionamiento y la deconstrucción de las narrativas dominantes en torno a un problema o situación pueden conducir a un primer nivel de reencuadre y, por tanto, iniciar otros niveles de reencuadre, en los que se exploran nuevas percepciones sobre los roles, las relaciones y la agencia (es decir, las capacidades, los intereses, los significados y los valores) en relación con el problema y/o situación. En este sentido, los cambios de percepción sobre la dinámica del sistema y sobre uno mismo (por ejemplo, reencuadrar los roles, capacidades, descripción propia y auto-construcción, y el sentido del "yo puedo"), pueden llevar a la creación de nuevos significados y narrativas. Como resultado del proceso de reencuadre, no sólo emergieron narrativas más sistémicas, sino también narrativas más empáticas y positivamente afectivas, subrayando la importancia de las relaciones afectivas en los procesos de transformación (Nightingale et al. 2022; Siqueiros-García et al. 2022). No obstante, nuestro enfoque supuso retos: consumió mucho tiempo, exigió que un pequeño grupo de personas estuvieran dispuestas a invertir tiempo y energía, nos exigió ceder control sobre el proceso, trabajar en diferentes niveles metodológicos y aceptar el potencial de resultados transitorios.

VII. Conclusión

A lo largo de este proyecto, mi experiencia de aprendizaje superó mis expectativas. Aprendí lo significativo y desafiante que es co-crear y mantener un proceso-espacio significativo y 'suficientemente seguro' que pueda permitir discusiones respetuosas en las que se logren expresar los sueños y los miedos, mientras se presta suficiente atención a las discrepancias y a la vulnerabilidad. Así, mi visión sobre los procesos transdisciplinarios también se ha transformado. Como también han señalado otros, tenemos que otorgar más tiempo para aprender de este tipo de experiencias, y tomarlas más en serio sin tomarnos demasiado en serio a nosotros mismos. Esto implica quitarnos nuestras máscaras académicas para involucrarnos como cualquier otra persona que trae un pesado equipaje lleno de marcos rígidos y prejuicios hacia dichos procesos, pero también como individuos con aspiraciones y voluntad de conectar con otros que pueden ser muy diferentes a nosotros. Hoy cuestiono aún más el significado tradicional de *medir* para los proyectos de investigación-acción, y el uso de herramientas y métodos que, aunque creativos y divertidos, si no son cuidadosamente pensados y flexibles, pueden convertirse en artefactos que separan aún más a los investigadores de los demás participantes.

Como se mencionó anteriormente, una agenda a futuro sobre este tema podría considerar desarrollar más investigación para comprender: 1) cómo la experiencia personal (i.e., estado de ánimo, actitud, mentalidad, etc.) está relacionada con la propia agencia individual, pero también

con la colectiva, y viceversa; 2) cómo aproximarse mejor al tema de participación en entornos en los que es evidente la falta de sentido de agencia; 3) cómo funcionarían estos métodos en un entorno en el que no se puede elegir a los participantes, y en qué otros tipos de entornos y configuraciones de grupo podría funcionar también un proceso de T-Lab, y cómo; y 4) qué otras señales de cambio podrían ayudar a determinar si este tipo de intervenciones están fomentando realmente un mayor sentido de agencia. Sin embargo, una pregunta más amplia que sigue pendiente es: *¿De qué manera podemos fortalecer una comunidad académica para que se involucre de manera más significativa en este tipo de procesos transdisciplinarios (i.e., uno que se centran más en los enfoques relacionales y de cuidado), a la vez que se resiste a la lógica de la publicación rápida, los resultados tangibles a corto plazo, las metodologías demasiado complejas, y las prácticas extractivas que parecen contradictorias con la esencia misma de estos esfuerzos?*

Como primer paso, este esfuerzo indica que trabajar hacia el cambio transformativo debe reconocer que la agencia colectiva es tanto el producto de las interacciones de los individuos en términos de relaciones sociales como de un cambio en la cognición. Mi investigación también ilustra que el trabajo hacia el cambio transformador exige la sensibilización de la posicionalidad, las capacidades y los valores de las y los investigadores, con el fin de saber si nos hemos transformado, y cómo lo hemos hecho. Mi tesis documenta cómo experimentar formas alternativas de actuar y crear alianzas y nuevas capacidades puede ser una forma de enactuar posibilidades de acción que se manifiestan en nuevas narrativas co-construidas. En conjunto, estos procesos de reencuadre están interconectados y evolucionan a través de la retroalimentación mutua para crear y fomentar las condiciones para el surgimiento de la agencia colectiva.

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