

Usando pensamiento sistémico y la metodología de sistemas blandos para alinear iniciativas de desarrollo sostenible en universidades

# III Congreso Iberoamericano de Soluciones Sistémicas para la Transformación de las Organizaciones III CISSTO

1, 2 y 3 DE DICIEMBRE DE 2021.



**SESGE**  
Sociedad Española  
de Sistemas Generales



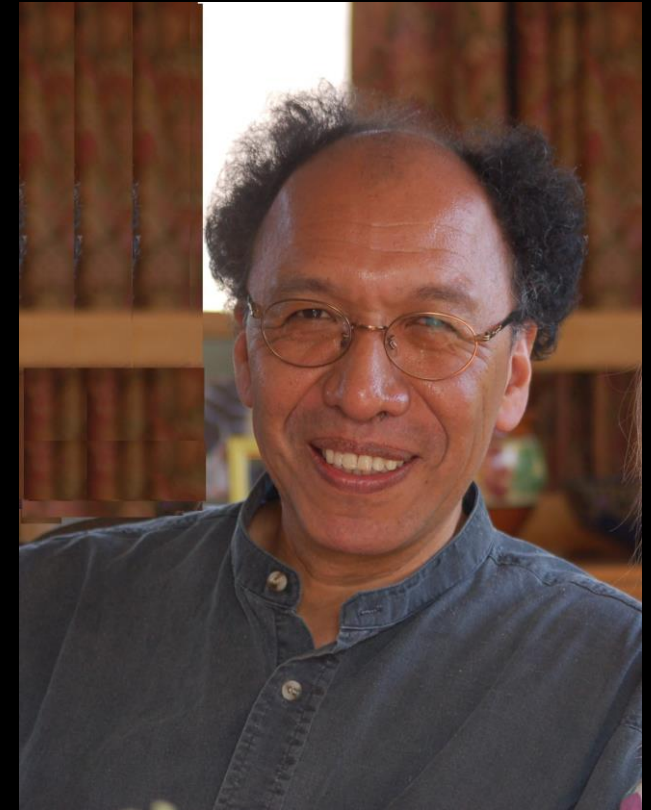
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# AGENDA

1. La crisis climática actual- Estado de Emergencia-
  - A new geological era?: the Anthropocene
2. El pensamiento sistémico como herramienta para entender la complejidad
  - a) Reduccionismo y Holismo (Pensamiento sistémico)
  - b) Algunos Principios del Pensamiento sistémico
3. Soft Systems Methodology / Metodología de Sistemas Blandos
  - a) Las 7 Etapas de SSM: El mundo Real y el mundo conceptual / Sistémico
  - b) Análisis CATWOE- Midiendo la performance de un sistema
  - c) Pensando acerca de nuestro Pensar. (*What we humans do when we do what we do*)
4. Alineando Proyectos Comunitarios con las SDGs usando elementos de metodología de sistemas blandos
5. Reflexiones Finales: **Las ideas que quisiera se lleven (takeaway) de esta charla**

Climate change: Intergovernmental Panel on Climate Change( IPCC) report is 'code red for humanity'









Deforestación producida por leñadores ilegales- bosque nacional Jamanxim, estado de Pará, Brasil.

## **UN's Intergovernmental Panel on Climate Change (IPCC), report key points**

- **Global surface temperature was 1.09C higher in the decade between 2011-2020 than between 1850-1900.**
- **The past five years have been the hottest on record since 1850**
- **The recent rate of sea level rise has nearly tripled compared with 1901-1971**
- **Human influence is "very likely" (90%) the main driver of the global retreat of glaciers since the 1990s and the decrease in Arctic sea-ice**
- **It is "virtually certain" that hot extremes including heatwaves have become more frequent and more intense since the 1950s, while cold events have become less frequent and less severe**



## A new geological era: the Anthropocene

According to the International Union of Geological Sciences (IUGS), the professional organization in charge of defining Earth's time scale, we are officially in the **Holocene** (“entirely recent”) epoch, which began **11,700** years ago after the last major ice age.

But that label is outdated, some experts say. They argue for “**Anthropocene**” from **anthropo**, for “man,” and **cene**, for “new”—

because human-kind has caused mass extinctions of plant and animal species, polluted the oceans and altered the atmosphere, among other lasting impacts.

<https://www.smithsonianmag.com/science-nature/what-is-the-anthropocene-and-are-we-in-it-164801414/>

## **A new geological era?: the Anthropocene**

The **Anthropocene** is a neologism invented by Crutzen and Stoermer (2000), to designate a new geological era in which human influences are so great that they are affecting 'whole Earth dynamics' through a range of biophysical and social processes

- Erosion and sediment transportation associated with anthropogenic processes (Agriculture, urbanisation and global warming)
- Changes in the chemical composition of the atmosphere
- Degradation of biosphere both on land and the sea

**'The hidden power of systems thinking'- Ison and Straw, Routledge, 2020**

**<https://www.routledge.com/The-Hidden-Power-of-Systems-Thinking-Governance-in-a-Climate-Emergency/Ison-Straw/p/book/9781138493995>**

# **El pensamiento sistémico como herramienta para entender la complejidad**

**El Pensamiento sistémico que tiene por objeto ayudar a generar nuevas perspectivas, introducir ideas de sistemas y desarrollar habilidades de pensamiento relacionales que son ampliamente aplicables a diferentes situaciones y contextos**

## **Los objetivos serán:**

- 1) Contrastar el reduccionismo con el Pensamiento de Sistemas**
- 2) Razones y el propósito de Pensamiento sistémico**
- 3) Subrayar algunos términos clave, conceptos y principios**
- 4) Implicaciones y aplicaciones del uso del Pensamiento Sistémico**
- 5) Ilustración breve: Alineando Proyectos Comunitarios con las SDGs usando la elementos de metodología de sistemas blandos**

## Los límites del reduccionismo

James Lovelock creador de la teoría Gaia, que ve la Tierra como un sistema auto-regulado y completo. ("Earth functions as a self-regulating system"). Lovelock puntualiza los problemas con los enfoques reduccionistas:

*"No se equivoquen, para entender la fisiología de la Tierra, cómo funciona Gaia, requiere una visión de arriba hacia abajo, una visión de la Tierra como sistema entero ... No tiene sentido reunir a meteorólogos, biólogos, científicos marinos, químicos atmosféricos, y así sucesivamente en un lugar y esperar resultados.*

*Debido a su formación que serán casi siempre reduccionista y de adoptar una perspectiva de abajo hacia arriba - una visión que asume que el todo no es ciertamente más que la suma de sus partes y que al tomar las cosas por partes, podemos descubrir cómo funcionan. Necesitamos la ciencia, pero debemos crecer de arriba hacia abajo como también de abajo hacia arriba ". Lovelock, Gaia-La ciencia para curar el planeta, 1991, p15*

## Los límites del reduccionismo

**‘This division is as much of a mistake as the error made by universities when they teach chemistry in a different class from biology and physics. It is impossible to understand these subjects in isolation because they are interconnected. The same is true of living organisms that greatly influence the global environment. The composition of the Earth’s atmosphere and the temperature of the surface is actively maintained and regulated by the biosphere, by life, by what the ancient Greeks used to call Gaia.**

**‘Almost 60 years ago, I suggested our planet self-regulated like a living organism. [..]. I was an outsider, an independent scientist, and the mainstream view then was the neo-Darwinist one that life adapts to the environment, not that the relationship also works in the other direction, as we argued. In the years since, we have seen just how much life – especially human life – can affect the environment. Two genocidal acts – suffocation by greenhouse gases and the clearance of the rainforests – have caused changes on a scale not seen in millions of years.**

**James Lovelock, The Guardian, 2 November 2021**

# ***El Pensamiento Sistémico y las Metodologías Sistémicas***

## **DOS MANERAS DE PENSAR: REDUCCIONISMO Y HOLISMO**

## **REDUCCIONISMO**

**'Tackle the hard piece by piece'**

**"Ataca lo difícil parte por parte"**

**Descartes 1642**

- **Reduccionismo: Método tradicional, científico de estudiar situaciones**
- **Enfoque en las partes es primordial; se busca identificar las partes, y se busca entender el todo a partir de las partes**
- **El problema es que el TODO frecuentemente tomo una forma que no es reconocible desde el punto de vista de las partes. (Ackoff: "como construir el automovil perfecto")**
- **El TODO emerge de las interacciones entre las partes las cuales se afectan unas a las otras a través de una red de relaciones**

## **REDUCTIONISMO: algunas características**

- **Sigue el pensar Lógico (si todos los hombres son mortales, y Sócrates es un hombre, entonces Sócrates es mortal”**
- **Reduce la TOTALIDAD en partes: va dirigido por el análisis**
- **Sigue el pensamiento causal (Pensamiento lineal) ('A' causa 'B')**
- **No es una útil manera de pensar cuando se enfrenta a situaciones complejas**
- **Tiende observar una situación específica y trata de generalizar**
- **Tiende a ser 'racional' y 'objetivo'**
- **Pero..: La complejidad no es predecible. Los sistemas se caracterizan por su interconectividad y sus lazos de retroalimentación**



# Pensamiento Sistémico o Pensamiento Holístico

- Aproximarse a los problemas examinando el contexto en los cuales los problemas ocurren, usando TODOS antes que ;as partes. (sistemas)
- *Holismo* considera que los sistemas son mas que la suma de las partes
- *Holismo* o Pensamiento Sistémico también se interesa por las partes, particularmente en las redes de relaciones entre las partes, principalmente en términos de como esas aparecen y sostienen en existencia la nueva entidad que es la Totalidad
- Es la Totalidad o el Todo el que se ve considera importante y este es el objeto del estudio.

## REDUCCIONISMO

1. Se basa en **Análisis**
2. Busca causalidad lineal (mono causal)
3. Ve **'snapshots'** o **'fotos'**
4. No toma en cuenta el entorno de los eventos (experimentos en Labs)
5. Se enfoca en la estructura: Revela el **'como'** las cosas funcionan
6. Ayuda a **"Describir"**
7. Produce **"Conocimiento"**

## PENSAMIENTO SISTEMICO

1. Se basa en **Síntesis** (es la disciplina de ver **"totalidades"/ "Wholes"**)
2. Se concentra en las inter-relaciones
3. Ve **patrones** de cambio
4. El ambiente (contexto) es crucial
5. Se enfoca en la función o procesos: Revela **"el porque"** las cosas funcionan
6. Ayuda a **"Explicar"**
7. Rinde **"Entendimiento"**

## **Dificultades**

- 1. Bien Definidos**
- 2. Es claro cual es el problema**
- 3. Relativamente claro quien es la gente envuelta en el caso**
- 4. La escala del tiempo es finita**
- 5. Problemas tiene claro las fronteras**
- 6. Complejidad 'Dura':**
- 7. Juego de Ajedrez: : Próxima jugada?: Complejo pero posible**

## **Líos/ 'Messes'**

- 1. Difícil de definir; no son estructurados**
- 2. No tienen claridad**
- 3. No hay una escala de tiempo**
- 4. Situación problemática sin límites/fronteras**
- 5. Complejidad "suave"/'Soft'**
- 6. Información es ambigua, es entendidas de manera diferente por diferente gente.**
- 7. Es como una historia: No se sabe que elementos o factores son relevantes y cuales no.**

# Cuatro ideas claves en el pensamiento sistémico

## **(1) Emergencia**

Las totalidades tienen propiedades emergentes, sus propiedades no tienen significado en términos (al nivel) de las partes

## **(2) Jerarquía:**

Sistemas pueden contener totalidades pequeñas en una estructura jerárquica.

## **(3) Comunicación y (4) Control:**

En totalidades con un propósito (intención) la comunicación y el control aseguran la sobre vivencia del sistema en un ambiente turbulento y siempre cambiante.

# Sistemas- Cuatro conceptos

- (1) Limite:** Separa lo que interesa y concierne- El sistema- de lo que está más allá, el ambiente con sus influencias externas
- (2) Nivel:** El detalle varia a diferentes niveles del sistema. Es común mover la atención a niveles menos detallados para ver los patrones de cambio y tener una visión más amplia
- (3) Perspectiva:** Diferentes puntos de vista (world view)  
*Pensar en términos de sistemas (practicar el pensamiento sistémico) es ponerse en los zapatos del otro. ('Systems thinking starts when you put yourself in the shoes of the other'- West Churchman)*
- (4) Feedback/retro-alimentación;** La información acerca del resultado se retroalimenta al inicio del proceso para poder controlarlo
  - Retro-alimentación negativa:** Compensa y balancea el proceso
  - Retro-alimentación positiva:** Exagera y re-enforza el proceso

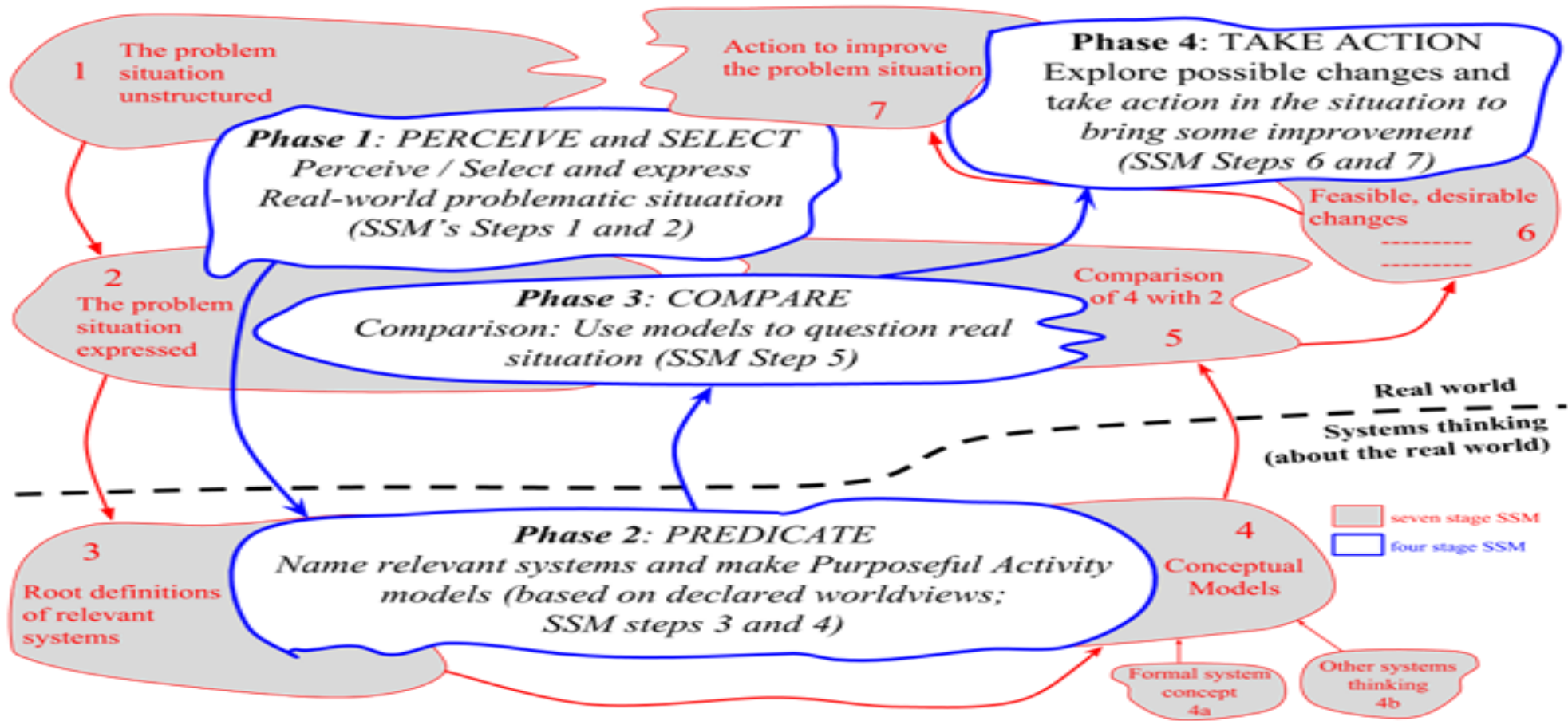
## Realidad y 'pensamiento' sobre la realidad

“La realidad – todo lo que somos, todo lo que nos envuelve, nos sostiene y, simultáneamente, nos devora y alimenta- es mas rica y cambiante, mas viva, que los sistemas que pretenden contenerla. A cambio de reducir la rica y casi ofensiva espontaneidad a la rigidez de nuestras ideas, la mutilamos de una parte de si, la mas fascinante: su naturalidad.

El hombre al enfrentarse con la *realidad*, la sojuzga, la mutila y la somete a un *orden* que no es el de la naturaleza[...] sino el del *pensamiento*.

Y así, no es la **realidad** la que realmente conocemos, sino esa parte de la realidad que podemos reducir a **lenguaje y conceptos**. Lo que llamamos conocimiento es el saber que tenemos sobre cualquier cosa para dominarla y sujetarla.

[...] Como un guerrero, el hombre lucha y somete a la realidad”.



**Figure 1.** The Basic Structure of Soft Systems Methodology: Four phases (Perceive/Select; Predicate; Compare; and Take Action) and SSM 7 steps/stages ( Jerardino-Wiesenborn, et al (2019), based on Checkland 1981)

SSM articulates a learning process which takes the form of an enquiry process in a situation that people are concerned about. This process leads to action in a never-ending learning cycle: once the action is taken, a new situation with new characteristics arises and the learning process starts again.

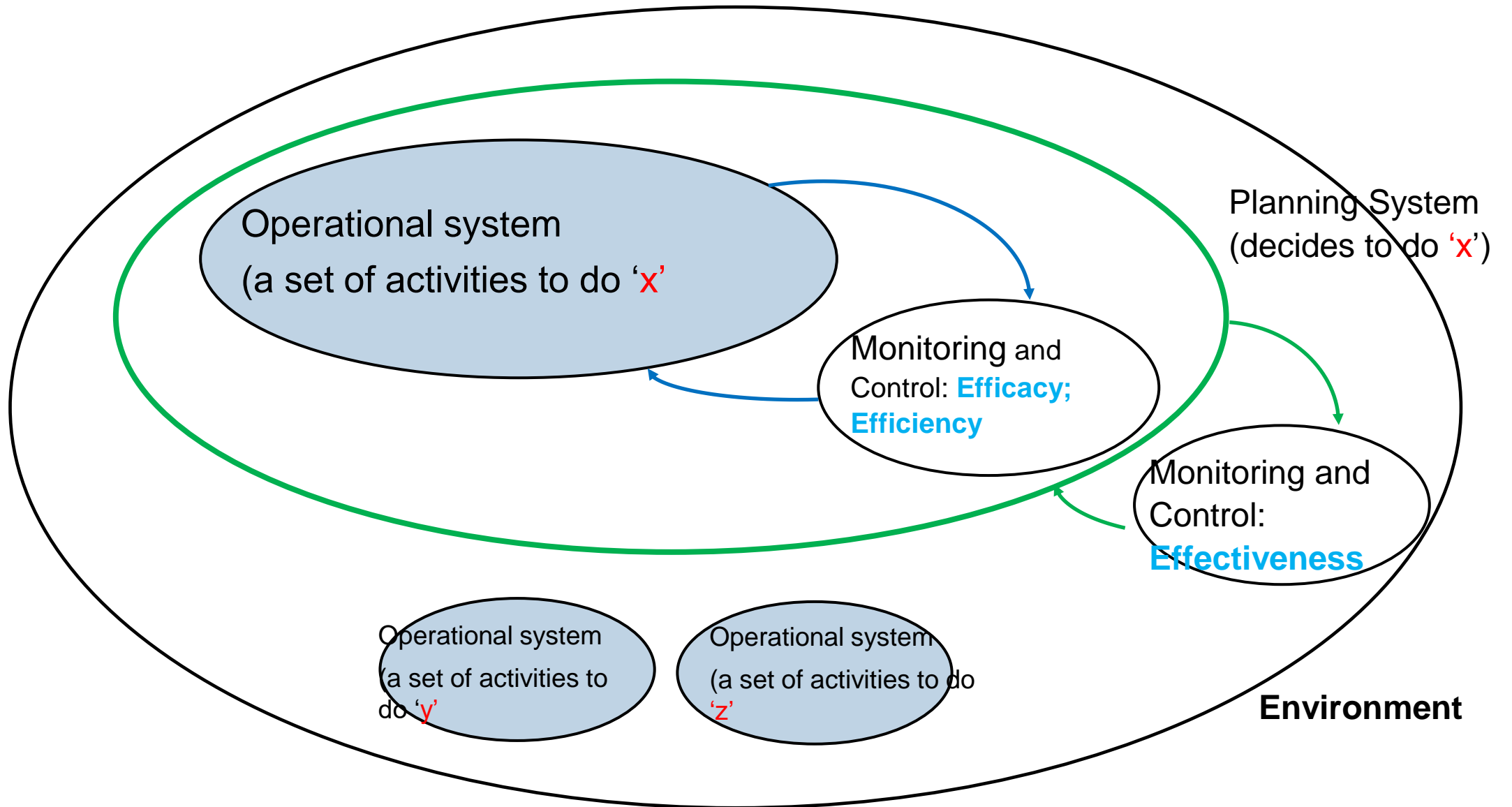
# Making sense and exploring a system's performance: SSM's CATWOE Analysis.

When we face a complex system and try to assess how well it is performing or how it ideally should perform, SSM offers a practical tool based on the analysis of the main elements that are present in a system. CATWOE is the SSM mnemonic of the six crucial characteristics which should be included in a well-formulated root definition of a relevant system, Checkland, 1981, 1999.

- C** 'Customers' - the beneficiaries or victims of the transformation process
- A** 'Actors' - those who would undertake the transformation process
- T** 'Transformation' - the conversion of input to output
- W** 'Weltanschauung' 'worldview' - the worldview that makes this transformation meaningful
- O** 'Owners' - those who could stop the transformation
- E** 'Environmental constraints' - elements outside the system which are taken as given.

From these elements, **T** is at the core of any root definition encapsulating the concepts that inputs are transformed into outputs as the root definition suggests.





**Fig. 2. Monitoring and Controlling a System (From Checkland 1989)**

So, if we think of the two levels expressed in Figure 2, we should ask the question:

## **How can the Transformation fail?**

For controlling purposes and ultimately for ‘managing’ this activity, the following reflections and possible answers are useful:

- The way chosen to do **T** might not work; therefore, we manage T by asking: Does T mean selected work? The answer measures the **Efficacy of T**, measured by the monitoring and controlling activities at the ‘operational system’ level.
- Is **T** being done with minimum resources (including time)? We manage T by asking: Is T being done with minimum resources? The answer measures the **Efficiency of T**, measured by the monitoring and controlling activities at the ‘operational system’ level.

So, if we think of the two levels expressed in Figure 2, we should ask the question:

### **How can the Transformation fail?**

For controlling purposes and ultimately for ‘managing’ this activity, the following reflections and possible answers are useful:

- **T** could be the wrong activity to be doing. We manage T by asking: Is T the right thing to be doing? The answer measures the **Effectiveness** of the System, measured by the monitoring and controlling activities at the ‘**planning system**’ level.
- This is ‘thinking about our thinking’ or ‘**what we humans do when we do what we do**’?

This question is a second-order question that in its answering invites reflexivity (i.e. reflection on reflection).

-‘The hidden power of systems thinking’- Ison and Straw, Routledge, 2020



# SUSTAINABLE DEVELOPMENT GOALS

**1** NO POVERTY

**2** ZERO HUNGER

**3** GOOD HEALTH AND WELL-BEING

**4** QUALITY EDUCATION

**5** GENDER EQUALITY

**6** CLEAN WATER AND SANITATION

**7** AFFORDABLE AND CLEAN ENERGY

**8** DECENT WORK AND ECONOMIC GROWTH

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE

**10** REDUCED INEQUALITIES

**11** SUSTAINABLE CITIES AND COMMUNITIES

**12** RESPONSIBLE CONSUMPTION AND PRODUCTION

**13** CLIMATE ACTION

**14** LIFE BELOW WATER

**15** LIFE ON LAND

**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

**17** PARTNERSHIPS FOR THE GOALS

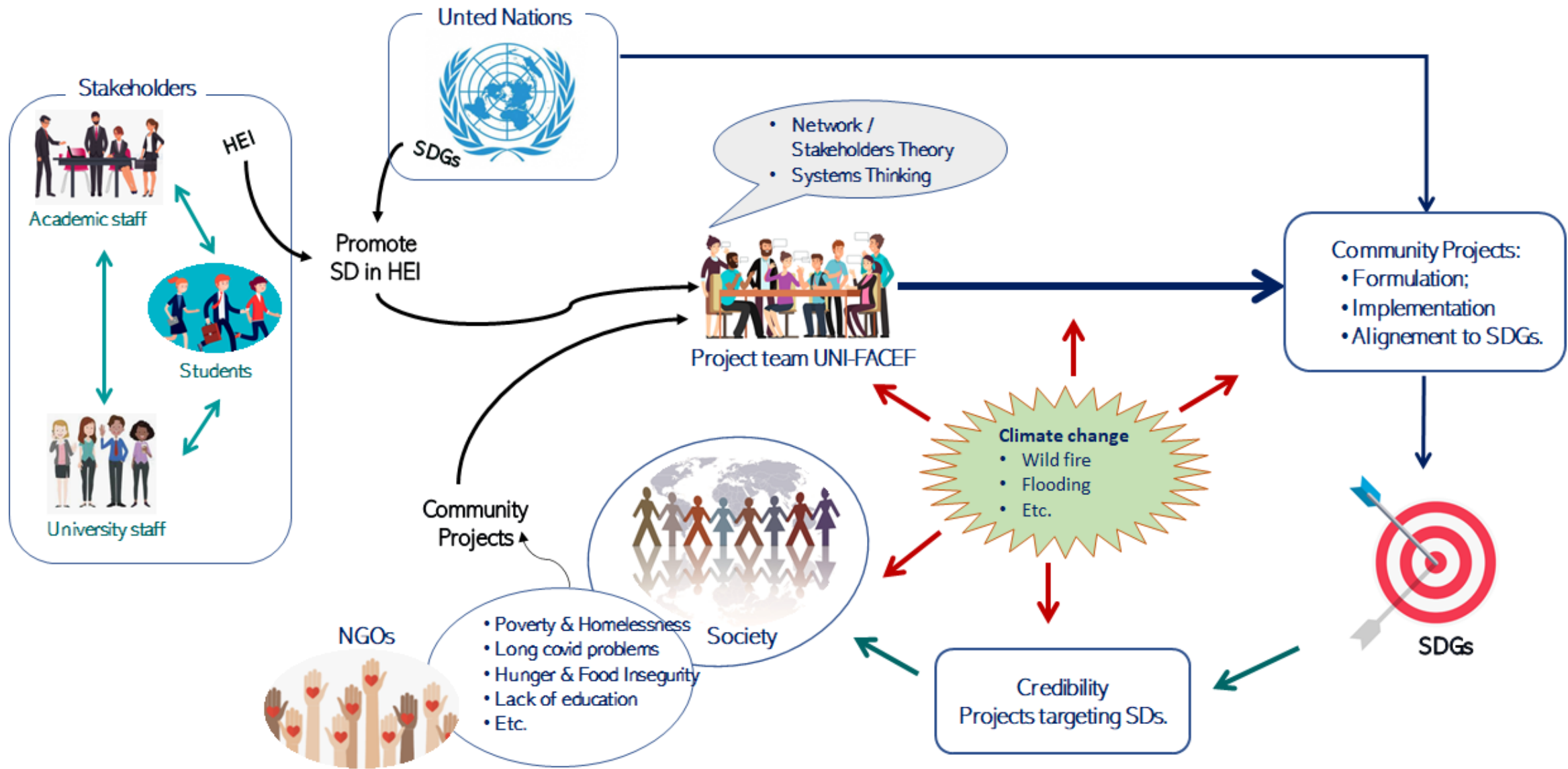
  
SUSTAINABLE DEVELOPMENT GOALS

## Using Soft System Methodology to align external community projects to SDGs at a Brazilian HEI action Network

Stakeholder	Terms of engagement in sustainability development (SD) community projects
<b>Students</b> University students, enrolled in an undergraduate course (applied social sciences, health, engineering, computing, or languages)	<ul style="list-style-type: none"><li>• Interested, proactive, but anxious to put the theory into practice.</li><li>• Learning and seeking engagement with community</li></ul>
<b>Academic Staff</b> Especially research active academics and teaching sustainable development in all UG programmes.	<ul style="list-style-type: none"><li>• The academic staff who get involved with social projects see this activity as an excellent opportunity to form groups willing to learn in an interdisciplinary setting.</li><li>• Learning experience contributes to improve their role and impact on community.</li></ul>

## Using Soft System Methodology to align external community projects to SDGs at a Brazilian HEI action Network

Stakeholder	Terms of engagement in sustainability development (SD) community projects
<p><b>Senior Academic Staff/Programme Leader</b>            Department Head (Graduation Course) Leader of the undergraduate courses</p>	<ul style="list-style-type: none"> <li>• Engagement often starts when university authorities (VCs) approach staff with specific community project.</li> </ul>
<p><b>External Institutions/NGO</b>            Community staff or Community institution (private, public, NGO) which see HEI as centre for continuous learning and exchange.</p>	<ul style="list-style-type: none"> <li>• Engagement sought with a specific need and looking for a viable solution.</li> </ul>
<p><b>Community</b>            Organised / no-organised population, needing a tangible outcome process from the project. Also, individual citizens.</p>	<ul style="list-style-type: none"> <li>• These see the university as a source of support, and exchange of experiences and problem solving</li> <li>• People who are or are not connected to the institutions, but they are confident in having the university as a support point for social issues.</li> </ul>



**Fig. 3: Rich Picture depicting the situation at Uni-FACEF Community Projects**

# Input and output in a transformation process of Community Projects system



Community Projects  
proposed by  
academic staff **not**  
**aligned** to SDGs

Community  
Projects proposed  
by academic staff  
**aligned** to SDGs



# Measuring performance of Community Projects network System: An SSM model

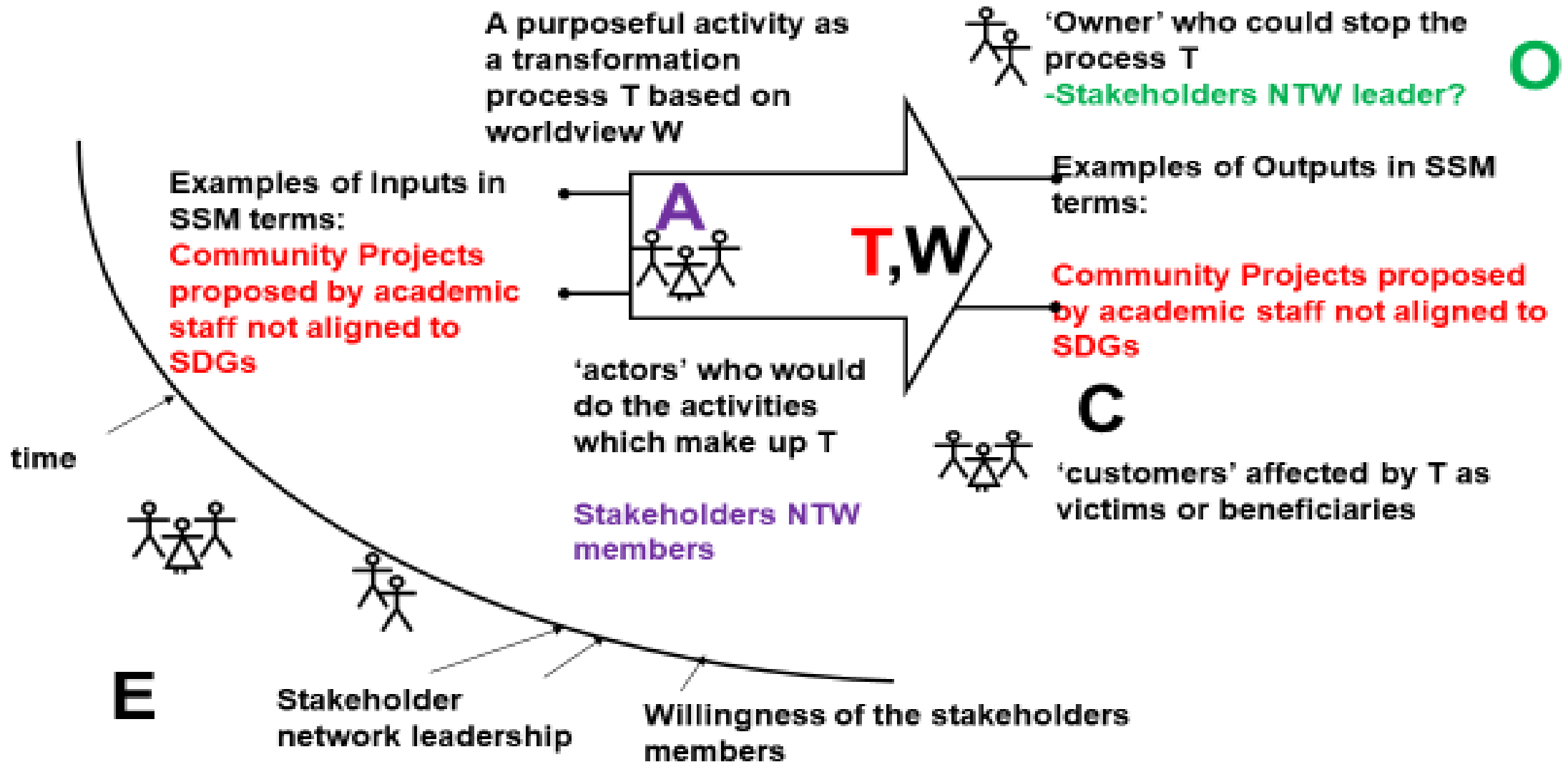


Fig. 4: A CATWOE of community project and SDGs system: SSM model (adapted from Checkland and Poulter, 2006)

Paucar-Caceres, A., Calvacanti-Bandos, M. Quispe-Prieto, S.; Huertas-Tantalaen, L., Werner-Masters, K. (2021) Using Soft System Methodology to Align Community Projects with Sustainability Development in Higher Education Stakeholders' Networks in a Brazilian University. *Systems Research and Behavioural Science*

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RESEARCH ARTICLE

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## Using soft systems methodology to align community projects with sustainability development in higher education stakeholders' networks in a Brazilian university

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### Abstract

The purpose of this paper is to report on the use of the soft systems methodology (SSM) to enhance the role of the higher education institution (HEI) stakeholder's action networks in achieving the sustainable development goals (SDGs). We review the literature on sustainable development in HEIs, in particular the role of stakeholder networks for the implementation of SDGs in HEI. We outline some of the features of SSM as an approach to help make sense of this complexity. CATWOE analysis, a conceptual SSM tool, is applied to a stakeholder's network hosted by a Brazilian university with the purpose of achieving the SDGs as part of the community projects (HEI external engagement). Findings of the systemic application suggest that the use of some elements of SSM helps clarify and make sense of the role of the stakeholders and assists in formalising action networks to achieve SDGs.

### KEYWORDS

soft systems methodology, stakeholders' network, sustainability in higher educational

**A manera de conclusiones preliminares  
Lo que quisiera se llevaran (takeaways) de esta charla**

**1. Vivimos en una nueva era geológica.**

We are officially in the **Holocene** (“entirely recent”) epoch, which began **11,700** years ago after the last major ice age.

But that label is outdated, some experts say. They argue for

“**Anthropocene**” from  
**anthropo**, for “man,” and  
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Mainly because human-kind has caused mass extinctions of plant and animal species, polluted the oceans and altered the atmosphere, among other lasting impacts.

**A manera de conclusiones preliminares  
Lo que quisiera se llevaran (takeaways) de esta charla**

**1. Reduccionismo o Pensamiento Sistémico?**

Potential benefits of systemic thinking over reductionism when facing complexity.

**2. Usefulness of Systemic Methodologies: Soft Systems Methodology (SSM)**

I have outlined on the application of some elements of SSM into a real-world community project currently managed by a Brazilian HEI. The University was concerned with aligning the portfolio of community projects with the sustainable development aims indicated in the SDGs.

**3. Pensando acerca de nuestro Pensar.**

(What we humans do when we do what we do?) Second order question. Requires invites reflexivity: reflection on reflection.

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# ¡GRACIAS!

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