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THE FACULTY OF ARCHITECTURE AND URBANISM
ARCHITECTURE DEPARTEMENT

Ph. D. Thesis
– Summary –

The regenerative culture of the built environment: Multicriteria decisions in the double-way spiral

Ph. D. Student:

Arch. Nina - Cristina Dițoiu

Schientific Coordinator:

Professor Ph. D. Arch. Mihaela Ioana Maria Agachi

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TABLE OF CONTENT

INTRODUCTION

The research started in 2016 as a study of integrated photovoltaic technology on buildings from the vernacular heritage of Transylvania. It has developed from residential to iconic/ representative in urban acupuncture-type interventions for regenerating the built environment's culture by contributing new technologies without irreversibly interfering with a heritage potential. A small-scale regeneration started from a study on photovoltaic technology, fascinating as an energy concept[1] with a significant impact on the design of new buildings, but also in the restoration phases/ rehabilitation of the existing built environment. Thus, the conferences[2] and training courses[3], primarily online, completed as a Ph.D. student during the energy transition and many changing paradigms, including in the research field, had a significant impact.

Figure 1.1 *Graphic design concept, sketched, Aqua Prociv Proiect, Cluj-Napoca*

The doctoral research in question, although it is in the category of practice-based research[4] (analysis based on practice with multidisciplinary case studies), framing according to the extensive and diverse area of the themes of the case studies, it was completed as research in the category of philosophy, phenomenology, according to the methodology.

I recall the relevant courses RESTORE Cost Action[5] (initiation in Regeneration), Living Future Europe Course[6] (Regeneration), PEARL PV Cost Action[7] (photovoltaic technology),

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[1] Krippnner, Roland– ed.,Gerd Becker, Ralf Haselhuhn, Claudia Hemmerle, Beat Kampfen, Roland Krippner, Tilmann E. Kuhn, Christoph Maurer, Georg W. Reinberg, Thomas Seltmann, Building -Integrated Solar technology-Architectural design with Photovoltaics and Solar Thermal Energy, Detail Green Books, Munch, Germany, 2017, pp. 64;

[2] Appendix 5: Conferinte perioada 2017-2023;

[3] Appendix 2 (disponibilă la cerere) - Certificate cursuri/conferinte;

[4] Lucas, Ray, "Research Methods for Architecture", Laurence King Publishing, 2016, pp. 43, pp. 59-68, pp. 153-159;

[5] RESTORE COST Action CA16114 - Rethinking Sustainability towards a Regenerative Economy-CA16114, supported by COST - European Cooperation in Science and Technology, Training School, Lancaster (U.K.), 14.11.2017-17.11.2017, WG 1 - 20 ore;

Transition workshop E.P.F.L. - École Polytechnique Fédérale de Lausanne[8] (urban planning - transition of the Anthropocene built environment) last and the most relevant. The transition from a small scale, that of Regeneration through interventions on architectural objects, to a holistic approach on an urban, territorial scale, with responsibility as part of a global system that functions in a network and is invariably interdependent, was achieved through the theoretical formation in the École Polytechnique Fédérale de Lausanne University. The impact achieved in water course landscape works as the case studies of current practice[9] were exceptional in scale and significant effects, and so captivating. In the research methodology, I tried to take over the experience gained as a practitioner, with transitions from one scale to another, from the criteria of theoretical Knowledge followed by a double-way spiral that facilitates Understanding.

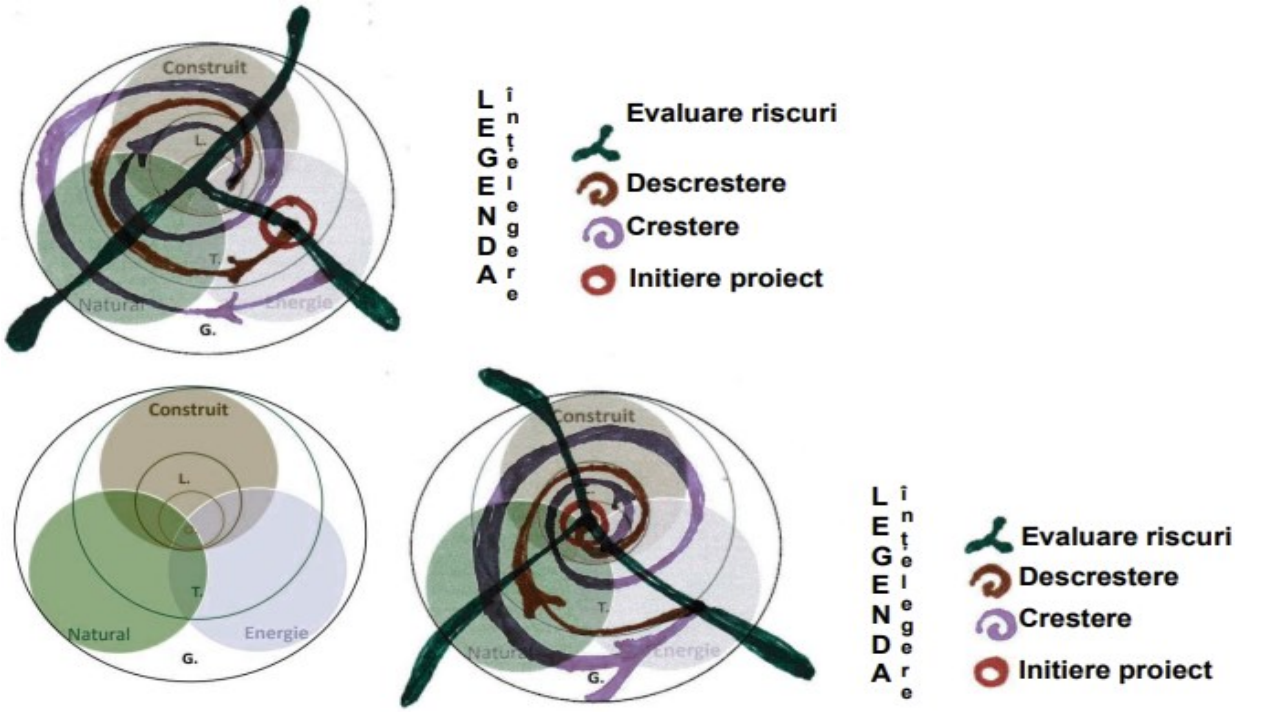

Figure 1.2 Diagrama „Cunoaștere" vs. „Înțelegere"/ "Understanding" vs. "Knowledge" Diagram, schițe explicative: LEGENDA INȚELEGERE/ UNDERSTANDING LEGEND: 1. Evaluare riscuri/ Risk assessment; 2. Descreștere/ Degrow; 3. Creștere/ Grow; 4. Inițiere proiect/ Design initiation as scale- domain.

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[6] *ILFI Ambassador certificat – membru LFE Technical Advisory Group; "1th LFE Masterclass Regenerative+Agile", Living Future Europe, în cadrul International Living Future Institute şi New European Bauhaus, 20.09.2021-15.12.2021, online, 30 ore, finanțare program ANTREDOC POCU/380/6/13/12392;*

[7] *PEARL PV COST Action CA 16235 - "Simulation tools and models for the analysis of PV system performance", Performance and Reliability of Photovoltaic Systems: Evaluations of Large-Scale Monitoring Data, Training School, Brașov, România, online, 06-09.07.2021;*

[8] Transition workshop 23 - Transition Workshop (braillard.ch) verificat 18.06.2023 *Masterclass Transition Workshop 2021", online, partea teoretică organizată de École; polytechnique fédérale de Lausanne - EPFL + Braillard Architects Foundation parte a Eco-Century Project, 4 ECTS credite, online 01.06.2021- 09.07.2021, certificat 15.03.2022; Lectori - P. Mantziaras (tranziția ecologică, Braillard Architects Foundation) , C. Binder (despre tranziție), M. Wackernagel (footprint/ biocapacitate), D. Bourg (limite planetare) , P. Droege (tranziția energetică), M. Schlaepfer (biodiversitate), P. Hollmuller (tranziția energetică), A. Athanassiadis (metabolism urban), A. Lehmann (infrastructura ecologică), G. Giuliani (cartografia schimbărilor climatice), A. Hedjazi (abordare holistică a sustanabilității urbane), T. Brosch (psihologia în comunicarea schimbărilor climatice), R. Sadleir (generarea schimbării), Baker-Brown, P. Vigano (studiu de caz, Geneva), W. Sobek (studiu de caz, arhitectura), V. Margout (studiu de caz, Paris);*

[9] *Ditoiu Nina-Cristina - Arhitect în cadrul Aqua Prociv Proiect SRL, Cluj-Napoca, proiecte amenajări cursuri de apă, colaborare cu specialiști ingineri specializările hidrotehnică, rezistență, mediu, sistematizare verticală, coordonare ing. Dan Săcui;*

"Understanding" vs. "Knowledge" is a Diad according to the views of Bennett[10], who detailed systematics to make the transition from "Knowledge" learned/ transmitted to "Understanding" that requires experimentation. Differentiating Understanding vs. Knowledge, David Seamon[11,12] applied J. G. Bennett's systematics to the "Place" Monad.

To approach "Regeneration" holistically, after David Seamon's Place Monad, the Research Methodology was defined as the Regeneration Monad, according to J. G. Bennett[13], systematics, with the impulses of the Triad as Dilation-Inflection-Contraction. The double-ways Spiral of Understanding is generated by going through criteria of Knowledge, the Research Methodology being an application of Bennett's systematics.

The Knowledge criteria are initially divided metaphorically into NATURAL/ BUILT/ ENERGY, with the following details related to the three metaphors to fit E.U. taxonomy environmental criteria. All three metaphors- NATURAL/ BUILT/ ENERGY - have a different impact depending on the scale of the project, from Object (Architecture Object including the site), Locality (Urban/Rural, including the geographical area), Territory (defined depending on the interpretation of the design author, it can be in the cultural or natural context, as the watershed in the study cases). The Global-scale is the "correct ascertainment" that includes sine qua non-design principles valid from the large to small scales.

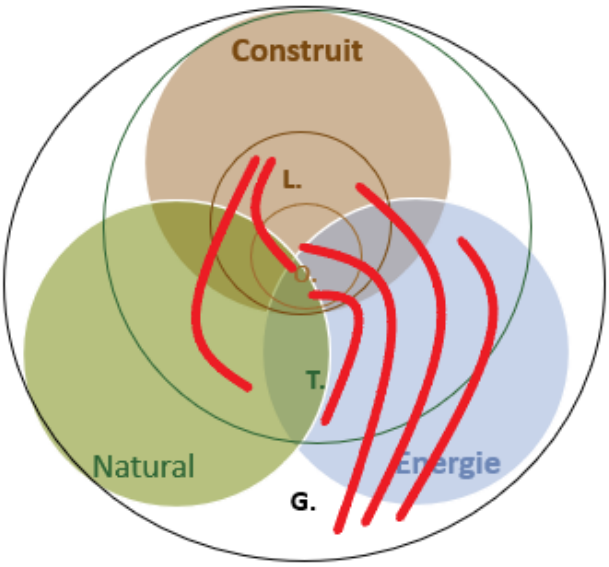

Figure 1.3 Links between scale levels red color – scale changes for a fine-tuning interconnection: O- architecture Object; L- Locality; T- Territorial planning; G- Global.

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[10] Bennett, J.G., Elementary systematics – a tool for understanding wholes, Bennett Books, the Estate of J.G. Bennett, United States of America, 1993, pg. 8-10;

[11] David Seamon, PhD in 1977 - Clark University, Worcester, MA USA, în acest moment profesor al Kansas State University, sursa David Seamon (researchgate.net)

[12] David Seamon este profesor de arhitectură, predă cursuri de estetică a mediului, apreciere arhitecturală și studii privind comportamentul aferent locurilor. Și-a primit doctoratul de la Universitatea Clark din Worcester, Massachusetts în 1977. Pregătit ca geograf și cercetător în mediu, Seamon este interesat de o abordare fenomenologică a locului, a arhitecturii, a căminului și sistematizarii ca amenajări de locuri, el dezvoltând după sistematica lui Bennett monada Loc. Cea mai recentă carte a lui este "Life takes place – Phenomenology, Lifeworlds, and Place-Making," Routledge, Taylor&Francis Group, New York si Londra, 2018; anterior, Seamon scrisese numeroase articole despre monada Loc, cum ar fi "Place, Place Identity, and phenomenology: a triadic Interpretation based on J.G. Bennett's Systematics," The role of place identity în perception, understanding, and design built environment, Hernan Casakin and Fatima Bernardo (Eds), Bentham Science Publishers, 2012;

[13] Bennett, J.G., Elementary systematics – a tool for understanding wholes, Bennett Books, the Estate of J.G. Bennett, United States of America, 1993, book edited by D. Seamon;

The evaluation of the Energy criterion- the photovoltaic technology - evaluates through detailed case studies in the related chapter Object with a preliminary design. In the case study of a replicable architecture as the traditional village, these assessments would allow a transition to the urban scale through checks of available surfaces to provide such technology after changing finishing materials.

A mosaic work realizes by a gray color (waterproofed built environment), adding the brown color (polluted environment) as a version related to a city. The gray color, as the brown also are used as blank– holes- to be able to intervene there with measures such as Energy (covering with a photovoltaic surface, the input of renewable Energy) or Renaturation (covering with surfaces greens, the contribution of biocapacity/ biodiversity or just drainage to take over the surplus water and restore the water reserve of the land into a water cycle). Thus, although the Energy criterion could be assigned to the Built, treated with technical calculations estimates – the preliminary design phase – it can be foreseen and addressed at a larger scale within an electrical energy grid.

Table 1 Criteria related to "Knowledge"

acronym	*measure↓*	*LEGEND - MEASURE/SCALE*	
N./O.	*I.1*	*NATURAL-Natural/*	*OBJECT plot scale*
N./L.	*II.1*	*NATURAL-Natural/*	*LOCALITY scale*
N./T.	*III.1*	*NATURAL-Natural/*	*TERRITORY scale*
N./G.(*)	*IV.1*	*NATURAL-Natural/*	*GLOBAL scale (*)The Global-scale is the "correct ascertainment" that includes sine qua non-design principles.*
C./O.	*I.2*	*BUILT – Construit /*	*OBJECT plot scale*
C./L.	*II.2*	*BUILT – Construit /*	*LOCALITY scale*
C./T.	*III.2*	*BUILT – Construit/*	*TERRITORY scale*
C./G.(*)	*IV.2*	*BUILT – Construit/*	*GLOBAL scale (*)The Global-scale is the "correct ascertainment" that includes sine qua non-design principles.*
E./O.	*I.3*	*ENERGY-Energie/*	*OBJECT plot scale*
E./L.	*II.3*	*ENERGY-Energie/*	*LOCALITY scale*
E./T.	*III.3*	*ENERGY-Energie/*	*TERRITORY scale*
E./G.(*)	*IV.3*	*ENERGY-Energie/*	*GLOBAL scale (*)The Global-scale is the "correct ascertainment" that includes sine qua non-design principles.*

All three scales O (Object)/ L (Locality)/ T (Territory) scales will run through the G (Global) scale. The Global-scale provides the relevant measures in the network or just the design principles that need to evaluate regardless of the project's scale. Thus, going through the three general criteria at the project scale, the most critical approaches are estimated to be implemented through the project or later.

"Other measures" appear in the criteria table to be assessed to allow framework flexibility. These are new measures that are not now needed or for which a validated large-scale technology has not yet been invented, such as drone aisles and their impact on the built environment, perhaps necessary as there is already the wildness corridor measure with restricted access for people. The last scale - Global - input the mandatory design principles in any approach to a project. Intelligible, this can be reduced to theoretical principles but could be constraints necessary on a large scale in certain situations that require thinking of the

Connectivity (environment as there are in the Connectivity of the Forest landscape or the longitudinal river connectivity) or of a network (as the Energy grid) are examples of a different criterion that can appear in the term "another measure," a standard that will be defined or not additionally if it appears as a necessity, determined by a change that occurred over time due to evolution, social, environmental or technological changes. Following the spiral course is done double-way: for example, through the risk assessment measure. If the risk of flooding is identified, a way to assess it is to decide the relevant scale through the return to the spiral in the opposite sense. Thus, in this particular case, large-scale flooding of a locality can also be solved by relocating it- Locality/Territory scale. But it could involve the assessment of the feasibility of the restoration of a monument (wooden church- Object scale): if it is decided to relocate the locality, the church will relocate with the inhabitants of the locality or just in an Ethnographic open-air museum.

Table 2 NATURAL/ NATURAL

Green	*Agriculture*	*Blue*	*Biodiversity*	*Soil*	*Risks related to measures*	*Other measures*
N._.1.a.1	N._.1.a.2	N._.1.b	N._.1.c	N._.1.d	N._.1.A/B/C/D	(…)

Table 3 CONSTRUIT/ BUILT

Recyclable	*Heritage Value*	*Cultural Landscape*	*Social*	*Degrowth*	*Risks related to measures*	*Other measures*
C._.2.a	C._.2.b.1	C._.2.b.2	C._.2.c	C._.2.d	C._.2.A/B/C/D	(…)

Table 4 ENERGIE/ ENERGY

Carbon footprint	*Water footprint*	*Renewable Energy*	*Energy consumption*	*Risks related to measures*	*Other measures*
E._. 3.a.1	E._. 3.a.2	E._. 3.b.1	E._. 3.b.2	E._..3.A/B	(…)

The same problem for a building without heritage values - the Object scale - could require a dam or a flood/ raise the level of the land to a higher level (giving up the ground floor/the ground floor turned into a flooded basement). I have detailed some empirical study cases to exemplify a spiral of Understanding that goes through the criteria of Knowledge as abstract notions or just challenging at the first assimilation. The case studies are on the scales O (architecture Object)/ L (Locality)/ T (Territory) scales with G (Global) check-ins that allow a reasonably formal evaluation of the proposed methodology. The thesis divides into three major chapters I. THE STATE OF THE ART, II. THE METHODOLOGY, and III. THE STUDY CASES. THE TERMS GLOSSARY is relevant in explaining some overused terms such as Regenerative culture, Scales analysis– Global/ Territory/Locality/Object, Metaphors of the evaluated Criteria– Natural/ Built / Energy; Bennett's Systematics with Monad/ Diad/ Triad; Spiral Symbol with the double-way course.

1 PART I, THE STATE OF THE ART

1 REGENERATION through the spiral of the New from the old story[14] includes, historically: Regeneration in Philosophy[15]- Platon[16] to M. Heidegger[17], Painting - Picasso[18] ,

[14] *Cornea, Andrei, „Noul o veche poveste", 2008, Ed. Humanitas, București;*

[15] *https://www.futurelearn.com/courses/philosophy-of-technology, Verbeek, Peter-Paul, curs de „Filosofia tehnologiei" curs online perioada 29 mai- 18 iunie 2017 ;(www.ppverbeek.nl);*

[16] *Platon, „Opere", VII, 1993, Ed. Științifică, București;*

Sculpture- Constantin Brâncuşi[19], architecture- Juhani Pallasmaa[20], Ana-Maria Dabija[21], Carlos Tapia Martin[22]; Psychology[23]-regenerative culture[24]; Urbanism-change of scale: Camillo Sitte[25] or Peter Kindel.[26]

2 REGENERATIVE DESIGN – PRACTICAL METHODS The second part of the research stage presented as regenerative design with 1. Recommendations and solutions based on Nature- NbS; 2. E.U. Taxonomy in environmental criteria; 3. S.D.G. 17 objectives; 4. SNASC - PNASC 2022; 5. Biodiversity; CONFERENCES PERIOD 2020-2023: represents a current and moment-specific way of documentation initiated in the COVID-19 pandemic, and the EVALUATED BIBLIOGRAPHY presents some relevant documentation references, both academic and practical, with case studies or recommendations/ guidelines. Regenerative design - practical methods details RESTORE COST Action CA16114, inspired by the Living Building Challenge philosophy to explore the restoration/regeneration system further. RESTORE's initial premise was to effect a paradigm shift in sustainability thinking, in practice, in academia and education, or among RESTORE members: Current Sustainability: Moving from Degenerative to Regenerative, Sustainability- minimization and elimination of impact, from doing less harm to starting doing good. Regenerative Sustainability - creating the conditions that allow social and ecological systems to thrive.

1. Recommendations Nature-based solutions[27]– NbS detailed through general recommendations NbS (Nature-based solutions)/ NcS (Natural Climate solutions). Nature-based solutions/ focus on addressing a more comprehensive range of challenges, from food security to disaster risk or climate change, and appear detailed for Forests/ Wetlands/ Grasslands/ Agriculture / Urban-Rural;

2. E.U. taxonomy[28] with environmental objectives such as Climate change mitigating; Climate change adaptation; D.N.S.H. water; D.N.S.H. circular economy; D.N.S.H. pollution; D.N.S.H. biodiversity;

3. S.D.G. 17 goals[29]: S.D.G. 17 objectives assumed by the European Union since July 14, 2021;

4. S.N.A.S.C.- P.N.A.S.C. 2022[30]: The first version of the S.N.A.S.C. "National Strategy on Adaptation to Climate Change for the period 2022-2030 with the perspective of 2050" and the

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[17] *Heidegger, Martin, "Originea operei de artă", 2011, Ed. Humanitas, Bucureşti, pp. 123;*

[18] *Ariens-Volker, Marijo, "Picasso et l'ócultisme a Paris - Aux origines des Demoiselles d'Ávignon", Marot Editions (Marge SPRL), Bruxelles, 2016, pg. 219-220 ;*

[19] *Pandrea, Petre "Brâncuși, Amintiri și exegeze", Ed. Meridiane, Bucureşti,1976, pp. 207-208;*

[20] *Pallasmaa, Juhani, "L'immagine incarnata- Immaginazione e immaginario nell'architectura", Safara Editore, Pordenone, 2014, pp. 174-175, traducere: "The Embodied image: Imagination and Imagery in Architecture", John Wiley&Sons Ltd., 2011 [tr.n.];*

[21] *Dabija, Ana Maria, "Tradition and innovation in contemporary Romanian architecture", PLEA2006 - The 23rd Conference on Passive and Low Energy Architecture, Geneva, Switzerland, 6-8 September 2006 [tr.n.];*

[22] *Tapia Martin, Carlos, „MCAS, Pensamiento homeotecnico- por una etica de las relaciones, no hostiles y no dominadoras", Recolectores Urbanos, Sevilla, 2015;*

[23] *Per Espen Stoknes este psiholog de origine norvegiană cu doctorat în economie, specializat în strategii pentru schimbările climatice, autor al cărții "What We Think About When We Try Not To Think About Global Warming: Toward a New Psychology of Climate Action" publicată la Chelsea Green Publishing în anul 2015 [tr.n.];*

[24] *Wahl, Daniel Christian, "Designing regenerative cultures," Triarchy Press, Axminster, England, with International Futures Forum, Aberdour, Scotland, 2016';*

[25] *Camillo Sitte- Arta Construirii Oraşelor- Urbanismul După Principiile Sale Artistice, 1991, Ed. Tehnică, Bucureşti;*

[26] *Kindel, Peter J., "Biomorphic Urbanism: A Guide for Sustainable Cities- Why ecology should be the fondationa of urban development", 18.04.2019, Biomorphic Urbanism: A Guide for Sustainable Cities| by SOM| Medium ;*

[27] *https://www.nature.org/;*

[28] *EU taxonomy for sustainable activities (europa.eu), vizitat 12.03.2023;*

[29] *Using United Nations Sustainable Development Goals as a compass for Europe's recovery'- register for the event on 14 July 2021 Sustainable Development Goals (europa.eu);*

P.N.A.S.C. "National Action Plan for its Implementation" represents strategic programming documents that cover the relevant fields;

5. Biodiversity: COP15 Declaration[31]- "No Paris, No Montreal" - COP15 took place from 7-19 December 2022 in Montreal, Canada, "No Paris, no Montreal: righting the ship for the ocean and its biodiversity" is the Declaration assessed as the biodiversity equivalent of the "Paris Agreement" from 2015.

2 PART II, THE METHODOLOGY, SPECIFIC PART

KNOWLEDGE versus UNDERSTANDING: KNOWLEDGE – the TECHNICAL CRITERIA for metaphors NATURAL, BUILT, and ENERGY. All are evaluated and applied through a specific methodology after a sketched spiral symbol about the UNDERSTANDING by double course spiral visualized as "the Knowledge vs. Understanding" diagram, with more parcourses on the double-way spiral; detailed after Benett's SYSTEMATIC[32] - with REGENERATION as MONAD, respectively as TRIAD for small-scale regenerations. These are the tools for achieving UNDERSTANDING through KNOWLEDGE without the needed experimentation.

Double-sense Spiral[33]

The criteria related to Knowledge are metaphorically divided into Nature + Built + Energy, overlapping on the scales of application from small-Architecture Object to large-Global, at least as principles that are worth applying regardless of the scale of the project (intermediating scales the Locality / the Territory). These criteria can be transmitted through learning to achieve Knowledge. To achieve Understanding, Bennett believed that experience is essential.

Thus, the Ise Japanese Temple artisans gain an understanding by rebuilding the temple, a sense that learning transmissible theoretical principles cannot achieve. Bennett's systematics offers a set of regulations applicable to the abstract, an academic way of reaching Understanding- through the antithesis thesis (Dyad) to the Hegelian dialectic (thesis, antithesis, synthesis), similar to the impulses of Bennett's Triad. The Hegelian dialectic offers a way of developing in a one-way spiral. But Bennett's Triads[34] offer a way of gaining and re-gain through a double-way spiral[35] covering the Knowledge necessary for achieving Understanding to make a multicriteria decision essential in any holistic solution.

The spiral course sketches note the equal weight of the metaphors of Knowledge in the creation of the rosette with three petals: C- CONSTRUCTED+ E- ENERGY+ N- NATURAL on the scales of O- Object, L- Locality, T- Territory, G- Global, applied for project starting point like T/N: Territory/ Natural.

3 PART III, THE EXPERIMENTAL PART

CASE STUDIES from the personal portfolio divided in GLOBAL as design principles applied on scales OBJECT/ LOCAlity/ TERRITORY.

Acronyms G- Global scale (principles of large-scale design, from the scale of a relevant territory that requires correlation as biodiversity or a networked system approach as the grid energy system, or only theoretical principles applicable at the scale of the planet) T- scale

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[30] *SNASC_SEA_2022.pdf (gov.ro), accesat 12.06.2023;*

[31] *The "No Paris without Montreal" declaration- Climate Champions (unfccc.int) (vizitat 12.06.23);*

[32] *Bennett, J.G., Elementary systematics– a tool for understandîng wholes, Bennett Books, the Estate of J.G. Bennett, United States of America, 1993;*

[33] *Chevalier, Jean, Gheerbrant, Alain, Dicionar de Simboluri, Mituri, vise, obiceiuri, gesturi, forme, figuri , culori, numere, vol 3, P-Z, Editura Artemis, Bucureşti, 1995 [1969 ;*

[34] *Bennett, J.G., op.cit;*

[35] *Wiesauer, Caro, 100xHudertwasser, Artist-Visionary-Non-conformist, Metroverlag, 2016;*

Territory (the area related to a project, unitary from a certain point of view: geographical, environmental, cultural.) L- Locality scale (Urban/ Rural) O- scale Object (architectural Object, including its related plot).

1 GLOBAL – SINE QUA NON-principles

1.1 NATURAL application– Landscape model that affects biodiversity[36];

1.2 ENERGY application– BIPV-3P reasoning model[37];

1.3 BUILT application– Standard Living Building Challenge-related model[38];

1.4 A similar SWOT analysis applicated to a design[39].

Following the case studies as OBJECT existing architecture/BUILT+ ENERGY, Rehabilitation of traditional architecture[40,41,42] details, calculus[43]; OBJECT existing architecture/ BUILT+ ENERGY, Restoration of wooden church Cojocna, Cluj county[44,45]; OBJECT new architecture/NATURAL+ BUILT+ ENERGY: Gura Râului utility building[46]; OBJECT new architecture/NATURAL+ BUILT+ ENERGY: Oradea administrative building[47,48]; LOCALITY/

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[36] *Rastandeh, A., Brown, D., K., Pedersen Zari, M. (2017). Biodiversity conservation in urban environments: a review on the importance of spatial patterning of landscapes. Ecocity World Summit, 12- 14 July. Melbourne, Australia;*

[37] *Dabija, Ana- Maria- ed., "Energy Efficient Building Design", Chapter 1 A Review of the Significance and Challenges of Building Integrated Photovoltaics, autori Daniel EfurosibinaAttoye, Kheira Anissa Tabet Aoul, Springer Nature Switzerland AG 2020;*

[38] *What Is The Living Building Challenge? - International Living Future Institute (living-future.org), vizitat 11.06.2023;*

[39] *Dițoiu, Nina- Cristina, Agachi, Mihaela Ioana Maria,"Romanian case study: challenges in the applicability of the Leeuwarden declaration on local buildings heritage" - acceptat 11.10.2019, publicat 30.09.2020 pg. 1247- 1257, Part of ISSN 2386- 8198, Part of ISBN 978-84- 09- 17873- 5, ISSN 2386- 8198, ISBN: 978- 84- 09- 17871- 1, conferința 8th Euro-lea American Congress- Construction Pathology, Rehabilitation Technology, and Heritage Management, 28 -30 septembrie 2020, Granada, Spania;*

[40] *Dițoiu Nina- Cristina, Mihaela Ioana Maria Agachi „Traditional architecture as an inspiration source for a sustainable contemporary design of the houses in Transylvania, Romania", website: www.eman-conference.org, pg. 1090- 1096; EMAN 2017 "International scientific conference on economics and management", 30 martie 2017, Ljubljana, Slovenia;*

[41] *Dițoiu Nina-Cristina Releveu și studiu de soluție- Biroul Individual de Arhitectură Dițoiu Nina-Cristina, relevee subcontractate de catre Interproiect s.r.l., Cluj- Napoca, 2012;*

[42] *Dițoiu, Nina- Cristina, "Tradition after the fourth industrial revolution: The solar architecture of the photovoltaic technology on vernacular homes from Transylvania's villages, Romania", susținere online în 06.08.2021, prezentare poster în cadrul PEARL PV COST Action CA 16235, al 3-leaTraining School "Simulation tools and models for the analysis of PV system performance", online, Brașov, România, iulie 2021;*

[43] *Dițoiu, Nina- Cristina, "A regenerative action as preservation measure of cultural landscape: the research of the photovoltaic technology upon Transilvania traditional architecture", WMCAUS 2022, Prague, Czech Republic, septembrie 2022, finantare prin programul ANTREDOC Cod proiect POCU/ 380/ 6/ 13/ 123927, urmează a fi publicat open- acces;*

[44] *Proiect "Conservare si revitalizare a patrimoniului, Cojocna, Cluj, România– Restaurare monument biserică de lemn," firma S.C. Aqua Prociv Proiect, Cluj- Napoca, Cluj, România, proiect 2014, 2018, recepție 2022, Proiectare: arh. Dițoiu Nina- Cristina, arh. Andreea Isdraila, ing. Dan Săcui, ing. Istvan Melensuck, ing. inst. Gheoghe Bibolar, Consultanți: Prof. univ. dr. arh. Adriana Matei ; studiu istoric: Prof. univ. ist. Nicole Sabău, ist. Ioana Rus, expertiză biologică: expert biolog Livia Bucșa;*

[45] *Dițoiu Nina- Cristina, Mihaela Ioana Maria Agachi, Mugur Bălan, "Newness touches conventional history: the research of the photovoltaic technology on a wooden church heritage building,"acceptat 23.03.2020, publicat open-acces 12.10.2020, Part of ISSN: 1757-899X, finanțare RESTORE COST Action CA16114, iopscience.iop.org/article/10.1088/1757-899X/960/2/022055; nr. citări: 2;*

[46] *Dițoiu Nina-Cristina- Arhitect în cadrul S.C. Aqua Prociv Proiect, Cluj- Napoca, proiecte amenajări cursuri de apă, colaborare cu specialiști ingineri specializările hidrotehnică, rezistență, mediu, sistematizare verticală, coordonare ing. Dan Săcui;*

[47] *Desene dwg, concept, randări Nina- Cristina Dițoiu- proiectant specializarea arhitectură, proiect faza incipientă studiu de soluție, S.C. Aqua Prociv Proiect, Cluj-Napoca, România;*

NATURAL+ BUILT+ ENERGY, Green-blue infrastructure Târgu Mureş locality[49]; LOCALITY/ NATURAL+ BUILT+ ENERGY, Watercourse landscape, Aiud locality, Alba county[50]; TERRITORY / NATURAL+ BUILT+ ENERGY, Jiul de Vest watercourse[51]; TERRITORY/ NATURAL+ BUILT+ ENERGY: Polders renaturation[52] ; TERRITORY/ NATURAL+ BUILT+ ENERGY: Zapodie Valey, Cluj[53].

In the end, the research aimed to create an algorithm that might be implemented as A.I. software to achieve Understanding starting from information and technical criteria related to Knowledge, but also treating an important topic, that of climate change, through the requirements defined for the three general domains treated as NATURAL/ BUILT/ ENERGY metaphors, the research aimed to create a model of an initial assessment of a project for a holistic approach to it according to environmental, social, Energy measures that require networking and correlations of solutions between several fields. Achieving an understanding that goes beyond the noticeable and assimilable results of Knowledge was proposed through a system similar to the semi-probabilistic approach, the assimilation of precise technical Knowledge related to the deterministic approach, through a spiral process associated with a probabilistic approach. The fact that in the Knowledge criteria tables, there is a blank column that can double with "other measures" represents the introduction of flexibility related to a "transition" from the Anthropocene to a Post-Anthropocene, to a Virtual with A.I. implications in establishing a solution for a built environment based on a regenerative culture. The flexibility of the criteria leaves space for additional inputs from other architectural researchers or from other technical or humanistic fields for the expansion of the requirements and for the sedimentation of regenerative culture in a multidisciplinary development.

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[48] Dițoiu, Nina- Cristina, Agachi, Mihaela Ioana Maria, "Multi-disciplinarity in the local, sustainable design of the buildings," Acta Technica Napocensis: Civil Engineering & Architecture Vol. 60 No. 3, publicat 15.03.2018 pp. 165-171, Part of ISSN: 1221- 5848, https://constructii.utcluj.ro/ActaCivilEng/download/atn/ATN2017(3)_15.pdf, susținere lucrare la workshop 07.07.2017 "Questions-between permanent and temporary," Cluj-Napoca, România;

[49] Ditoiu Nina- Cristina- Arhitect în cadrul S.C. *AquaProciv Proiect, Cluj- Napoca, proiecte amenajări cursuri de apă, colaborare cu specialişti ingineri specializarile hidrotehnică, rezistenţă, mediu, sistematizare verticală; consultant de specialitate, şef de proiect- ing. Dan Săcui;*

[50] Desene cad, concept, arh. Dițoiu Nina-Cristina, proiectant coordonator specializarea arhitectură în cadrul S.C. Aqua Prociv Proiect, Cluj-Napoca, România, director ing. Dan Săcui;

[51] Nina- Cristina, Dițoiu[1),2)], Abdulamit Altan[)], Dumitrașcu, Daniel-George[4)], Tărău, Radu[4)], *"*A case study about a regenerative action: P.V. technology on a Romanian river *landscape", 1) Architecture Departement, Technical University of Cluj-Napoca, Cluj-Napoca, România, 2) A quaprociv Proiect, Cluj- Napoca, Romania, 3) Hydrotechnical Engineering Department, Technical University of Civil Engineering Bucharest, România, 4) Energobit Control Systems, Cluj-Napoca, România, lucrare evaluată ca referat de absolvire „Transition Workshop 2021", propunere capitol carte;*

[52] Renaturare poldere Zerind, Tamasda, S.C. Aqua Prociv Proiect: schiță concept arh. Dițoiu Nina- Cristina; coordonator specialități, consultant specialitate ing. Dan Săcui;

[53] Studiu de soluție Amenajare valea Zăpodiei, Cluj, Prezentare powerpoint studiu proiect, S.C. Aqua Prociv Proiect, arh. Dițoiu Nina- Cristina, consultant ing. Dan Săcui;

2 OBJECT scale

2.1 Architectural OBJECT/ BUILT+ ENERGY, existing residential vernacular HERITAGE, replicable - thesis chapter 3.2.1[54,55,56 57]

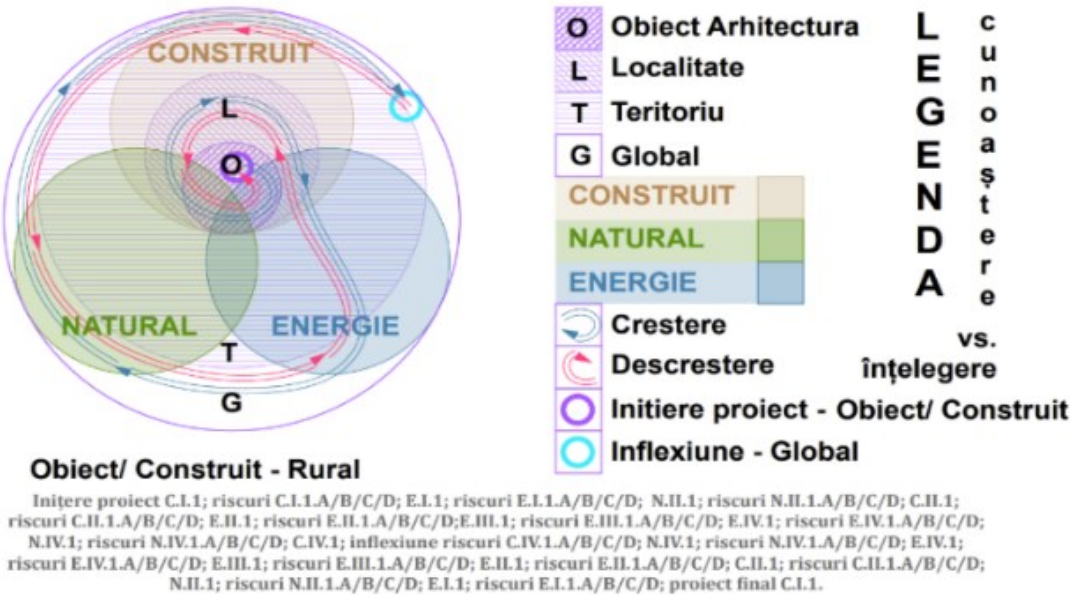

Figure 2.1.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point in Object/ Built area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

BUILT - Traditional Replicable house- Roșia Montană town, Alba county;
BUILT - Traditional Replicable house- Rușor township, Pui commune, Hunedoara county.
ENERGY- Energy consumption/production from Rușor, Pui commune, Hunedoara county vs. Roșia Montana, Alba county.

The electricity consumption calculated to combat energy poverty, as necessary for a replicable traditional individual dwelling with a usable area of less than 100 sqm for two studied locations. In both sites studied, the essential utilities covered by an air-water heat pump+ the photovoltaic surface related to the buildings realize through the covering of photovoltaic tiles. The proposed regenerative action represents a measure to preserve the cultural landscape by using photovoltaic technology in traditional architecture through photovoltaic tiles, but also a viable solution to combat energy poverty as prosumers by assuming the intervention as an acupuncture event of the "Place."

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[54] *Dițoiu Nina- Cristina, Mihaela Ioana Maria Agachi „Traditional architecture as an inspiration source for a sustainable contemporary design of the houses in Transylvania, Romania", website: www.eman-conference.org, pg. 1090- 1096; EMAN 2017 "International scientific conference on economics and management", 30 martie 2017, Ljubljana, Slovenia;*

[55] *Dițoiu Nina-Cristina Releveu și studiu de soluție- Biroul Individual de Arhitectură Dițoiu Nina-Cristina, relevee subcontractate de catre Interproiect s.r.l., Cluj- Napoca, 2012;*

[56] *Dițoiu, Nina- Cristina, "Tradition after the fourth industrial revolution: The solar architecture of the photovoltaic technology on vernacular homes from Transylvania's villages, Romania", susținere online în 06.08.2021, prezentare poster în cadrul PEARL PV COST Action CA 16235, al 3-leaTraining School "Simulation tools and models for the analysis of PV system performance", online, Brașov, România, iulie 2021;*

[57] *Dițoiu, Nina- Cristina, "A regenerative action as preservation measure of cultural landscape: the research of the photovoltaic technology upon Transilvania traditional architecture", WMCAUS 2022, Prague, Czech Republic, septembrie 2022, finantare prin programul ANTREDOC Cod proiect POCU/ 380/ 6/ 13/ 123927, urmează a fi publicat open- acces;*

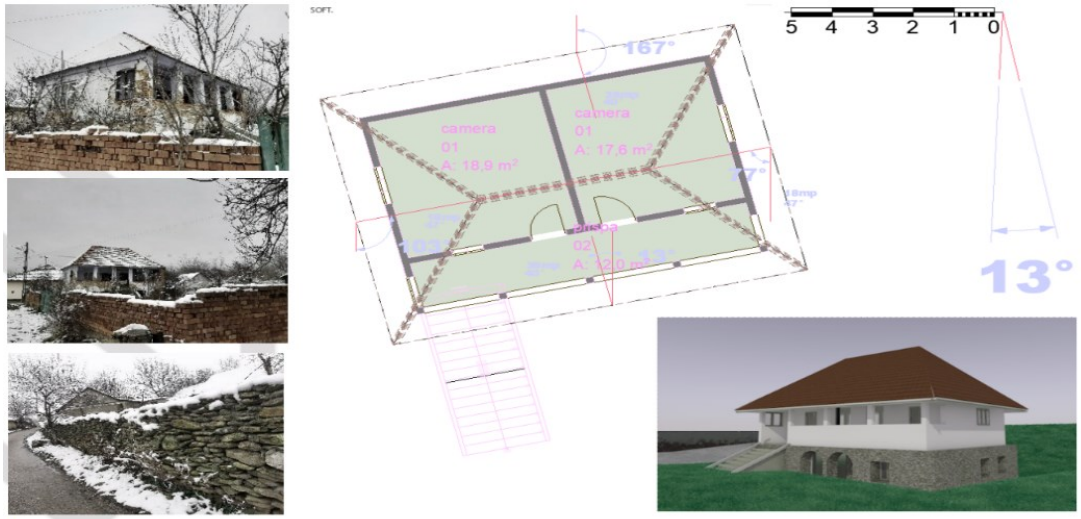

Figure 2: Photos taken in January 2021, Rusor, Hunedoara county, Romania / cad

Figure 2.1.2 Image from the poster "Tradition after the fourth industrial revolution: The solar architecture of the photovoltaic technology on vernacular homes from Transylvania's villages, România"[58] details, calculus[59]

2.2 Architectural OBJECT/ BUILT + ENERGY, HERITAGE Vernacular: Restoration of a wooden church, Cojocna, Cluj county - thesis chapter 3.2.2[60,61]

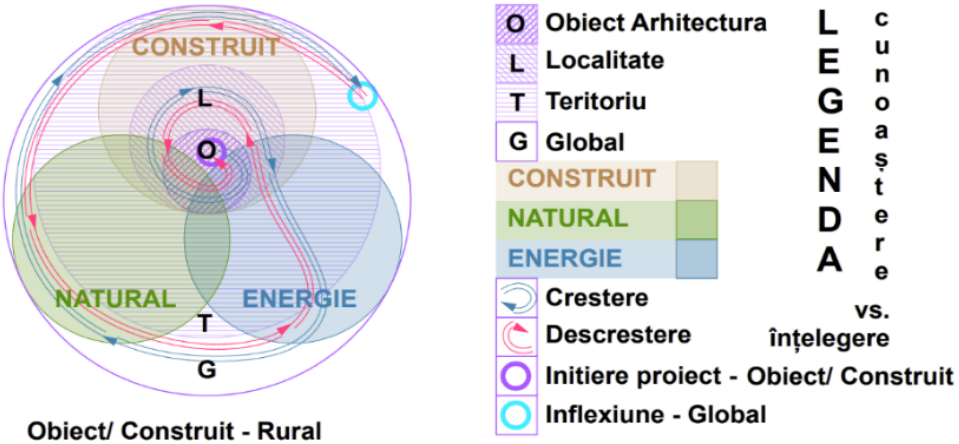

Figure 2.2.1 Knowledge versus Understanding, Legend O - architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point in Object/ Built area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

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[58] Dițoiu, Nina- Cristina, "Tradition after the fourth industrial revolution: The solar architecture of the photovoltaic technology on vernacular homes from Transylvania's villages, Romania", op. cit;

[59] Dițoiu, Nina- Cristina, "A regenerative action as preservation measure of cultural landscape: the research of the photovoltaic technology upon Transilvania traditional architecture", op. cit;

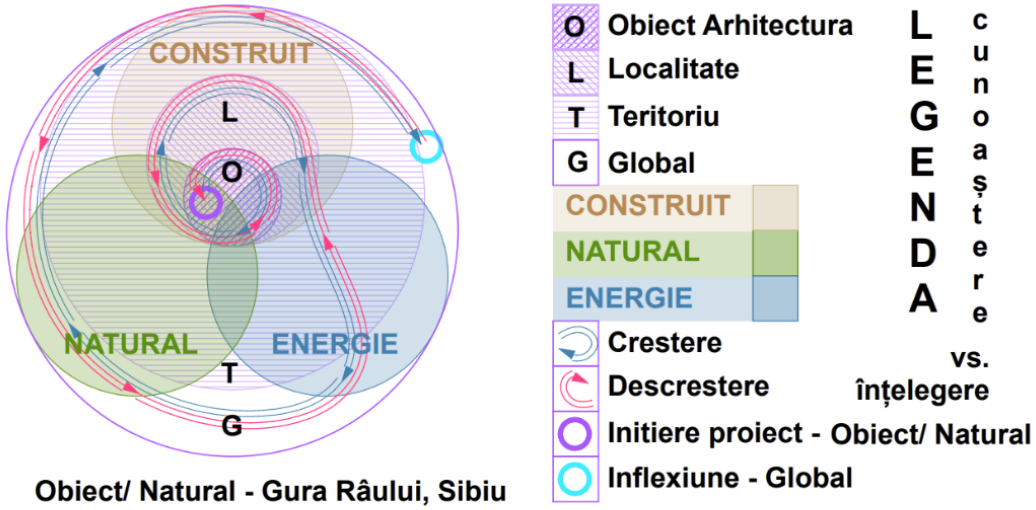
[60] Proiect "Conservare si revitalizare a patrimoniului, Cojocna, Cluj, România– Restaurare monument biserică de lemn," firma S.C. Aqua Prociv Proiect, Cluj- Napoca, Cluj, România, proiect 2014, 2018, recepție 2022, Proiectare: arh. Dițoiu Nina- Cristina, arh. Andreea Isdraila, ing. Dan Săcui, ing. Istvan Melensuck, ing. inst. Gheoghe Bibolar, Consultanți: Prof. univ. dr. arh. Adriana Matei, ; studiu istoric: Prof. univ. ist. Nicole Sabău, ist. Ioana Rus, expertiză biologică: expert biolog Livia Bucșa;

[61] Dițoiu Nina- Cristina, Mihaela Ioana Maria Agachi, Mugur Bălan, "Newness touches conventional history: the research of the photovoltaic technology on a wooden church heritage building,"acceptat 23.03.2020, publicat open-acces 12.10.2020, Part of ISSN: 1757-899X, finanțare RESTORE COST Action CA16114, iopscience.iop.org/article/10.1088/1757-899X/960/2/022055; nr. citări: 2;

Cojocna, județ Cluj.

BUILT- By current standards, the objective of restoration work is to preserve heritage value and should not meet any sustainability targets. An analysis of a future intervention on a vernacular heritage building was proposed from three different perspectives: Variant 1, the executed variant, with a wooden shingle roof to be rebuilt in the coming years as a maintenance intervention– the metaphor about "Identity"; Variant 2 with the replacement of wooden shingle boards with the new photovoltaic solar stone tiles- the "Sustainability" metaphor; Option 3, "Identity"+ "Sustainability," a patent proposal for photovoltaic wooden shingles- ENERGY. The evaluation of electricity produced for the preliminary design phase with the proposal to implement focused on sharing with the disadvantaged members of the community.

2.3 Architectural OBJECT/ NATURAL+ BUILT+ ENERGY, Industrial HERITAGE potential, blue-green infrastructure: Utility building in the dam area, Gura Râului, Sibiu county- thesis chapter 3.2.3[62]



Inițere proiect N1.1; riscuri N.I.1.A/B/C/D; C.I.1; riscuri C.I.1.A/B/C/D; E.I.1; riscuri E.I.1.A/B/C/D; N.II.1; riscuri N.II.1.A/B/C/D; C.II.1; riscuri C.II.1.A/B/C/D; E.II.1; riscuri E.II.1.A/B/C/D;E.III.1; riscuri E.III.1.A/B/C/D; E.IV.1; riscuri E.IV.1.A/B/C/D; N.IV.1; riscuri N.IV.1.A/B/C/D; C.IV.1; inflexiune riscuri C.IV.1.A/B/C/D; N.IV.1; riscuri N.IV.1.A/B/C/D; E.IV.1; riscuri E.IV.1.A/B/C/D; E.III.1; riscuri E.III.1.A/B/C/D; E.II.1; riscuri E.II.1.A/B/C/D; C.II.1; riscuri C.II.1.A/B/C/D; N.II.1; riscuri N.II.1.A/B/C/D; E.I.1; riscuri E.I.1.A/B/C/D; proiect final N.I.1.

Figure 2.3.1 Knowledge versus Understanding, Legend O - architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point in Object/ Natural area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale locality Gura Râului, Sibiu county.

"Knowledge" vs. "Understanding" diagram from figure 2.3.1, with the starting point Object/ Natural - Gura Râului, Sibiu, detailed: Starting point/ project initiation N1.1; risks N.I.1.A/B/C/D; C.I.1; risks C.I.1.A/B/C/D; E.I.1; risks E.I.1.A/B/C/D; N.II.1; risks N.II.1.A/B/C/D; C.II.1; risks C.II.1.A/B/C/D; E.II.1; risks E.II.1.A/B/C/D; E.III.1; risks E.III.1.A/B/C/D; E.IV.1; risks E.IV.1.A/B/C/D; N.IV.1; risks N.IV.1.A/B/C/D; C.IV.1; as risk assessment - inflection C.IV.1.A/B/C/D; N.IV.1; risks N.IV.1.A/B/C/D; E.IV.1; risks E.IV.1.A/B/C/D; E.III.1; risks E.III.1.A/B/C/D; E.II.1; risks E.II.1.A/B/C/D; C.II.1; risks C.II.1.A/B/C/D; N.II.1; risks N.II.1.A/B/C/D; E.I.1; risks E.I.1.A/B/C/D; final N.I.1.

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[62] *Dițoiu Nina-Cristina- Arhitect în cadrul S.C. Aqua Prociv Proiect, Cluj- Napoca, proiecte amenajări cursuri de apă, colaborare cu specialiști ingineri specializările hidrotehnică, rezistență, mediu, sistematizare verticală, coordonare ing. Dan Săcui;*

The installation of photovoltaic panels - ENERGY - was estimated in the preliminary design phase as a potential for electricity production without being included in the project. The rehabilitation of the dam and its related installations was recommended concerning its heritage values potential, as a landmark in the area's cultural heritage, and its potential as an industrial/technical heritage - BUILT. As assumed recommendations for some following stages, it was using the heritage potential by arranging the area with the additional leisure function with specific equipment in the technical areas of the dam that remained unused, as visiting the channel built for the river redirection in the stage of the dam execution. The starting point was set on the NATURAL domain from the evident reasons for the importance of the blue-green infrastructure of the river and the associated dam, even if the measures for longitudinal Connectivity were not assumed in the project. It was considered a risk measure justified by the technical heritage potential of the dam. But using the remembered unused channel with landscape for leisure is also an opportunity for this longitudinal Connectivity.

2.4 Architectural OBJECT / NATURAL+ BUILT+ ENERGY, Blue-Green Infrastructure: Iconic administrative building, bioclimatic/ biophilic- NbS, Oradea locality, Bihor county- thesis chapter 3.2.4[63],[64]

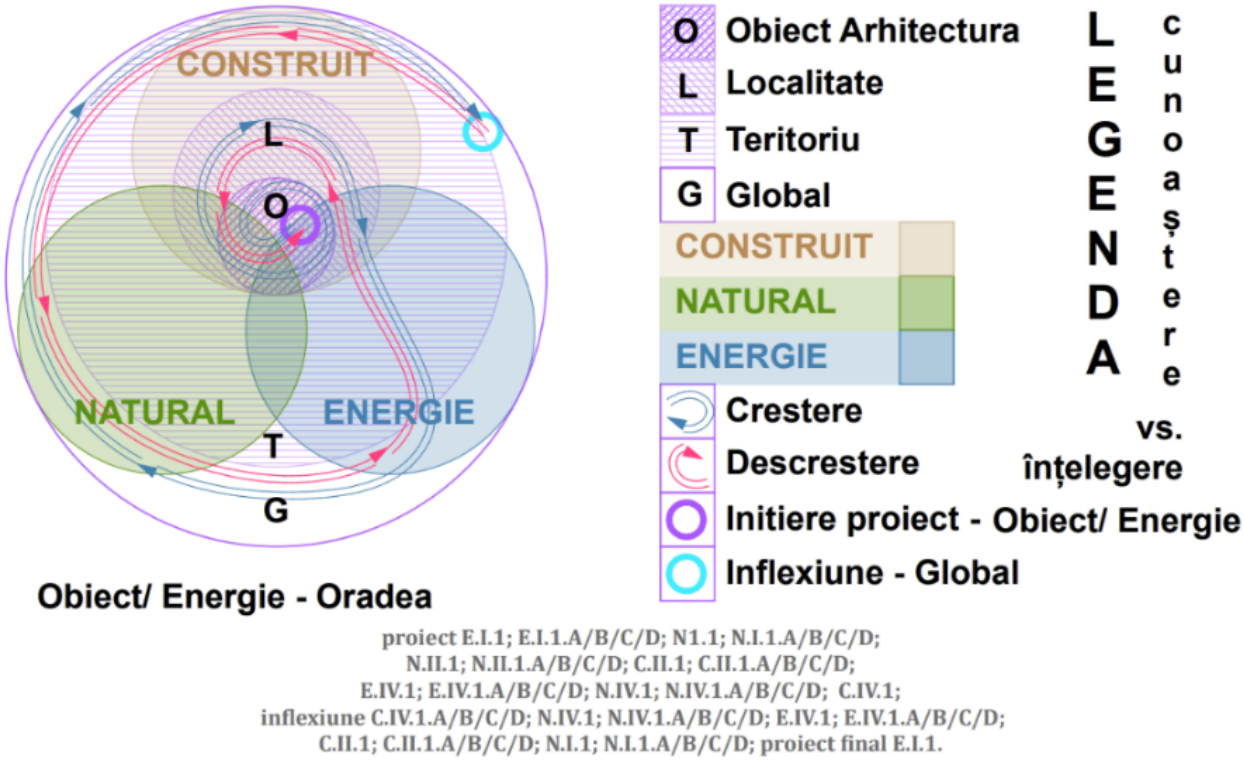

Figure 2.4.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point in Object/ Energy area; Inflexiune Globa– Inflexion point from Grow to Degrow at Global scale locality Oradea, Bihor county.

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[63] *Desene dwg, concept, randări Nina- Cristina Dițoiu- proiectant specializarea arhitectură, proiect faza incipientă studiu de soluție, S.C. Aqua Prociv Proiect, Cluj-Napoca, România;*

[64] No. 6 Appendix 4 Dițoiu, Nina- Cristina, Agachi, Mihaela Ioana Maria, "Multi-disciplinarity in the local, sustainable design of the buildings," Acta Technica Napocensis: Civil Engineering & Architecture Vol. 60 No. 3, publicat 15.03.2018 pp. 165-171, Part of ISSN: 1221-5848, https://constructii.utcluj.ro/ActaCivilEng/download/atn/ATN2017(3)_15.pdf, susținere lucrare la workshop 07.07.2017 "Questions-between permanent and temporary," Cluj-Napoca, România;

The starting point is Object/ Energy, even if the domain related is unbuilt. The building design has a bioclimatic concept, and the photovoltaic technology was assumed from the concept phase even though it was not assimilated in the execution and implementation as ulterior stages from the budget-based perspective.

The wave's equation inspired the graphic representation of vertical sunshades of an iconic building- BUILT- a representative institution positioned on the "Peta" watercourse in Oradea locality, Bihor county. The planimetry shape of the plan with an inner courtyard remembers the identity of the place. The concept of the building is the water that nourishes the vegetation. The wave equation from the form of vertical sunshades also mentions the blue-green infrastructure. NATURAL- NbS, the vegetation surrounds the "water" from three sides and develops ivy vegetation with a sunshade role on two facades, respectively, the vegetated terrace roof. Part of the sustainability measures, such as the photovoltaic system- ENERGY- calculated provided, achievable as possible at a later phase.

Figure 2.4.2 Left side photos 26.06.2023, Corian material vertical waved sunshades mounted partially/ Right side photos 27.05.2021, execution stage.

3 LOCALITY scale

3.1 Urban LOCALITY/ NATURAL+ BUILT+ ENERGY, INDUSTRIAL HERITAGE, blue Green infrastructure: Renaturation Turbinei channel, Târgu Mureș locality, Mureș county- thesis chapter 3.3.1[65]

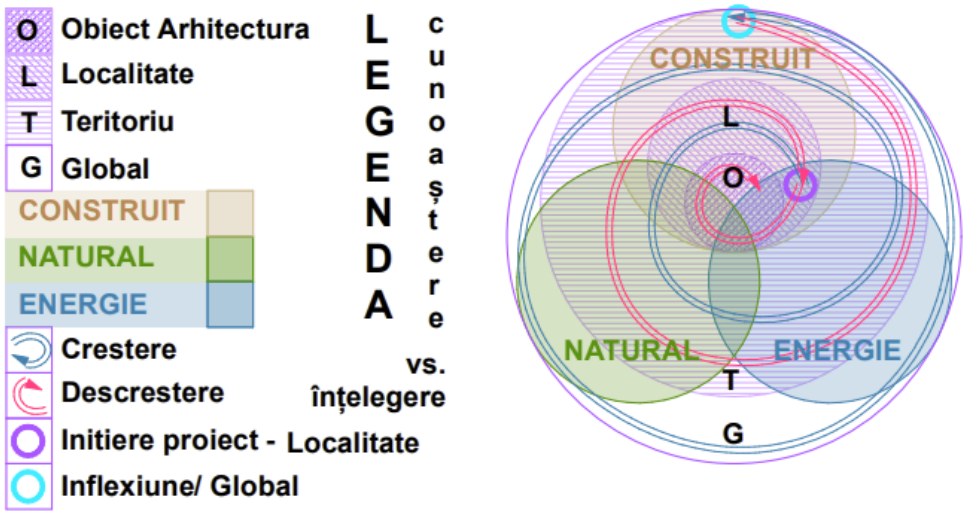

Figure 3.1.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Natur+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point LOCALLITY/ ENERGY area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

The starting point is ENERGY/ Locality as a restoration intervention on an existing functional dam L.M.I. MS-II-a-B-15519. NATURAL/ Locality- The development of the blue-green infrastructure of the locality Târgu Mureș, starting from the watercourse with green corridors arranged on one of the banks, adaptation according to the existing human development (after 50%-50% Kindel's concept[66]). The longitudinal Connectivity of the watercourse is supported by several possible variants, of which: Variant 1.1/1.2– with the abolition of existent MHC for the longitudinal Connectivity on the Turbinei channel with Renaturation; Variant 2- Longitudinal Connectivity on the Mureș river with a bypass through the loisir area channel on Dam no. 1: historically protected monument with the abolition of Dam no. 2, unprotected. A plan is followed to expand the green infrastructure from the watercourse through solutions presented on the existing street profiles, with green Connectivity through taking over answers on every plot on an urban level strategy. The BUILT/ locality domain was touched by restoring an infrastructure-built-protected industrial and technical heritage.

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[65] *Ditoiu Nina- Cristina- Arhitect în cadrul* S.C. *AquaProciv Proiect, Cluj- Napoca, proiecte amenajări cursuri de apă, colaborare cu specialişti ingineri specializarile hidrotehnică, rezistenţă, mediu, sistematizare* verticală; *consultant de specialitate, şef de proiect- ing. Dan Săcui;*

[66] *Kindel, Peter J., "Biomorphic Urbanism: A Guide for Sustainable Cities- Why ecology should be the fondationa of urban development", 18.04.2019, Biomorphic Urbanism: A Guide for Sustainable Cities| by SOM| Medium ;*

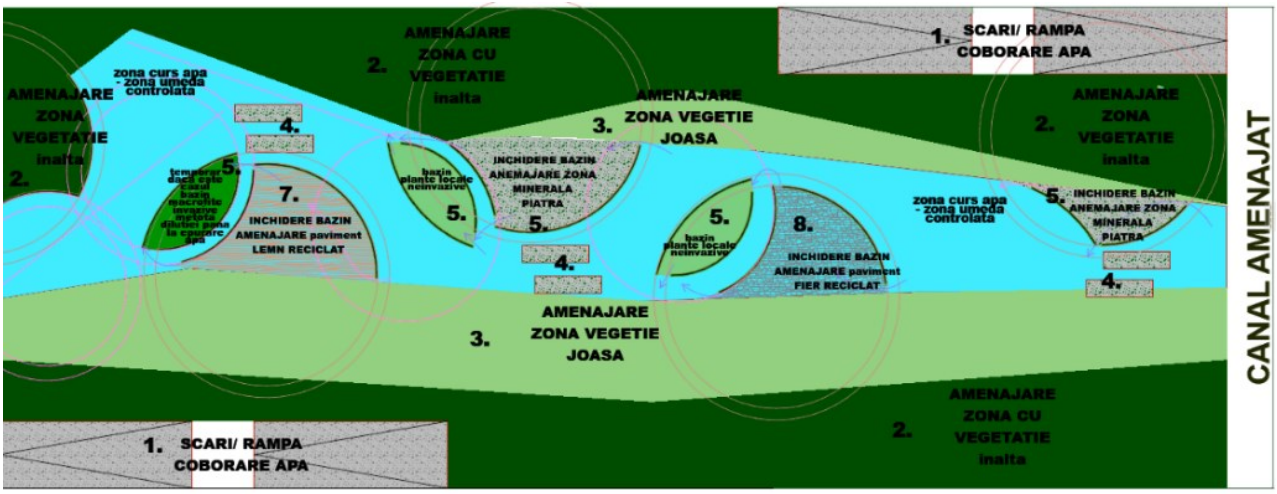

Figure 3.1.2 The cad sketch with a detailed Variant 1 of the channel with controlled flow, the upstream area that crosses the heritage-built protected of the Târgu Mureș locality [67].

3.2 Urban LOCALITY/ NATURAL+ BUILT, blue-green infrastructure: Aiudel watercourse landscape, Aiud locality, Alba county- thesis chapter 3.3.2[68]

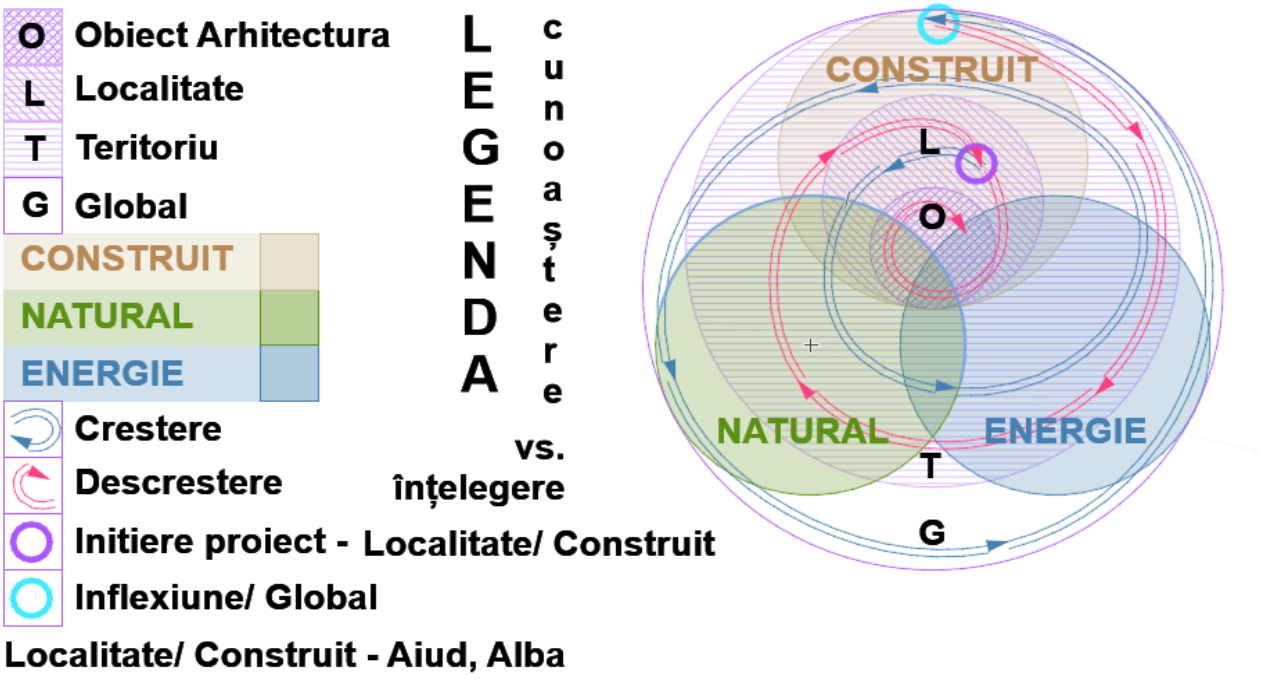

Figura 3.2.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point LOCALLITY/ BUILT area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

Measures develop green Connectivity as infrastructure with vegetation corridors of various sizes at different heights, contributing to biodiversity and biocapacity– NATURAL domain. Issues that need solving are indicated, such as the arrangement of green spaces and the regularization of the watercourse to reduce the risk of floods. With the development of the

[67] *Ditoiu Nina- Cristina- Arhitect în cadrul* S.C. *AquaProciv Proiect, op. cit;*
[68] *Desene cad, concept, arh. Dițoiu Nina-Cristina, proiectant coordonator specializarea arhitectură în cadrul S.C. Aqua Prociv Proiect, Cluj-Napoca, România, director ing. Dan Săcui;*

blue-green infrastructure, the proposed solution indicates ways of increasing the space for the river in the city center or the peripheral inner city, which allows the Velo infrastructure along the watercourse. As assess the flood risk, the walls extend vertically with structural glass parapets that increase the section supported during the flood period-other measures provided for longitudinal Connectivity.

The archaeological heritage of Aiud involves specific steps in developing the watercourse, including the descent to the water with a crossing under the pedestrian bridge in the representative historical center - BUILT domain. The case study did not assess the potential for renewable Energy with a photovoltaic technology solution. However, the direction of the river flow from west to east allows for such an assessment, a south-oriented retaining wall covering or heritage buildings' roofs with solar photovoltaic tiles to ensure nZEB measures in the historic city center- ENERGY domain.

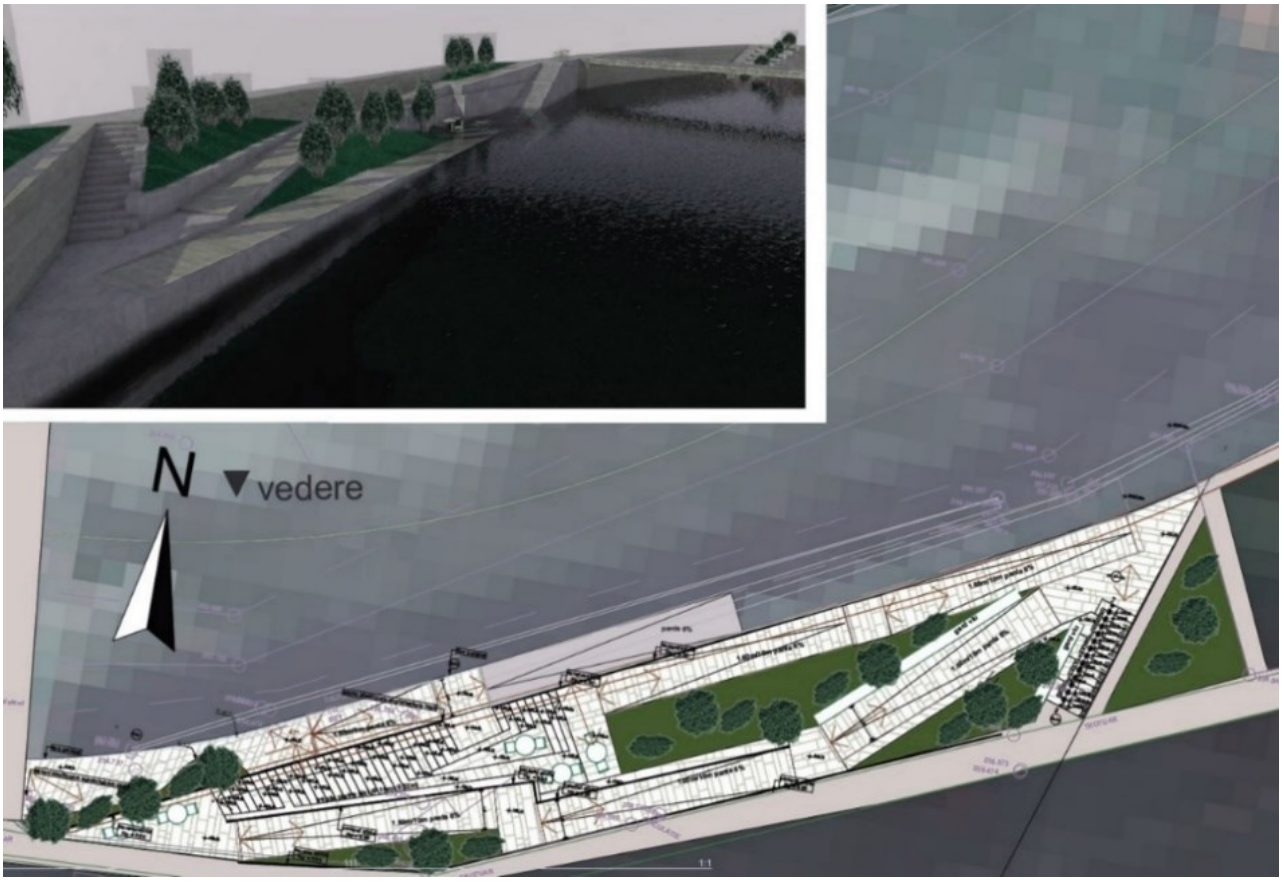

Figure 3.2.2 Detail- The area downstream of the pedestrian bridge, stairs/ ramps for accessibility to the watercourse.[69]

[69] *Ibidem;*

4 TERRITORY scale

4.1 TERRITORY/ NATURAL+ BUILT+ ENERGY, INDUSTRIAL HERITAGE, blue-green infrastructure: Jiul de Vest watercourse landscape, Hunedoara county- thesis chapter 3.4.1[70]

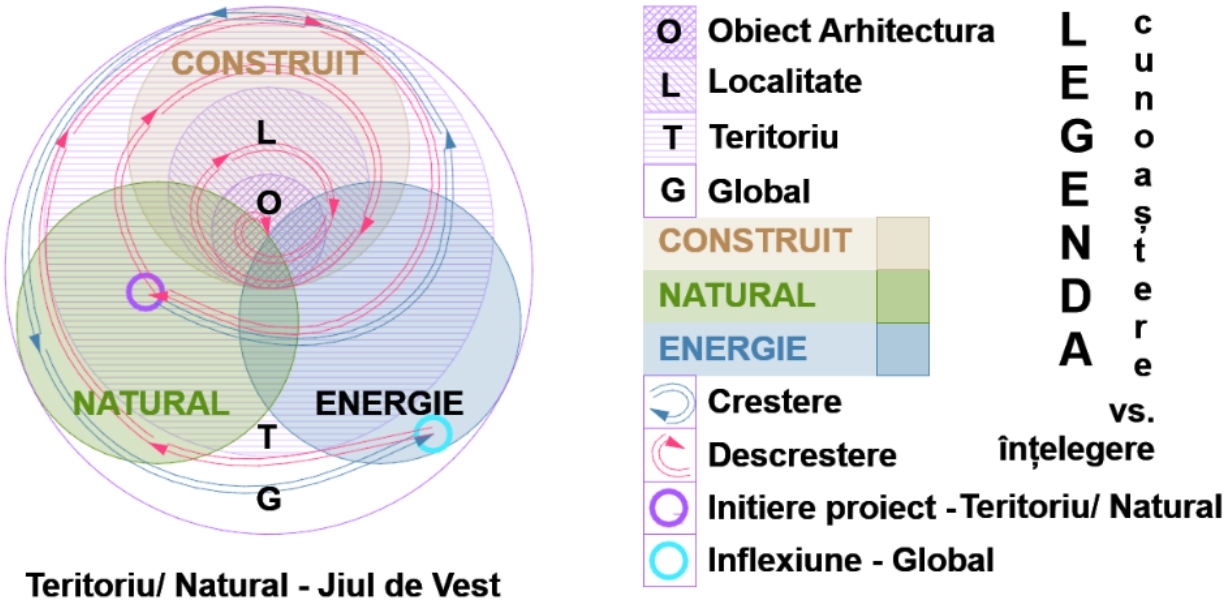

Figura 4.1.1 Knowledge versus Understanding, Legend O - architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere - Grow; Descreștre– Degrow; Inițiere proiect– Starting point TERRITORY/ NATURAL area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

The case study concerns a regenerative action with photovoltaic technology inserted in a Romanian riverside cultural landscape. Any environment is a "blue"/"green"/"grey"/"brown" mosaic, and regenerative measures aim to change the proportion in the positive direction of redesigning the Anthropocene human environment.

The "grey"/"brown" Anthropocene background needs Regeneration. The "blue" and "green" need protection, expansion, or Renaturation. Photovoltaic technology was not the original option, but it is suitable for the current state of the art. The Jiul de Vest watercourse is an impressive area with natural, archaeological, and industrial heritage, with "gray"/"brown" environmental interventions that require regenerative actions but spectacular as an industrial/technical heritage value.

ENERGY [E]/ NATURAL [N]/ BUILT [C] are the acronyms of the primary measures in climate change issues. ENERGY [E]: Photovoltaic technology is versatile with many aesthetical forms. NATURAL [N]: Blue-green infrastructure crucial for biodiversity highlights on the empirical watercourse model with an adjacent wildness corridor. BUILT [C]: Built as a circular economy measure with recycled materials - wood and other existent concrete works - reusing and preserving the history or identity of the place.

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[70] Nina- Cristina, Dițoiu[1),2)], Abdulamit Altan[)], Dumitrașcu, Daniel-George[4)], Tărău, Radu[4)], *"A case study about a regenerative action: P.V. technology on a Romanian river landscape", 1) Architecture Departement, Technical University of Cluj-Napoca, Cluj-Napoca, România, 2) A quaprociv Proiect, Cluj- Napoca, Romania, 3) Hydrotechnical Engineering Department, Technical University of Civil Engineering Bucharest, România, 4) Energobit Control Systems, Cluj-Napoca, România, lucrare evaluată ca referat de absolvire „Transition Workshop 2021", propunere capitol carte;*

All these measures will be applied to the Regeneration per case study while maintaining the specificity[71] of a riparian cultural landscape: for the energy transition to regenerable ENERGY [E][72],, NbS biophilic design measures NATURAL [N][73], and measures to preserve-recycle-reuse the built environment BUILT[74], [Construit/ C], carried out in the context of the D.N.S.H. principles. Thus, they are proposed for analysis and applied as possible.

4.2 TERRITORY/ NATURAL+ BUILT+ ENERGY, Green-blue infrastructure: Renaturation of Zerind, Tămasda polders, Bihor & Arad counties- thesis chapter 3.4.2[75]

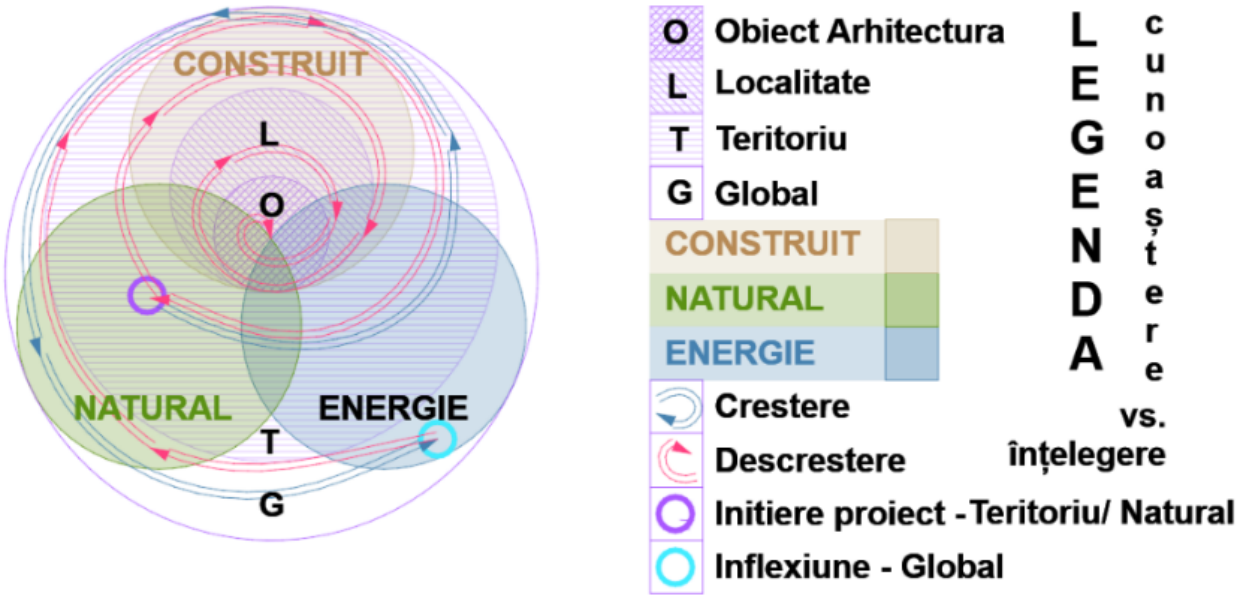

Figura 4.2.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point TERRITORY/ NATURAL area; Inflexiune Global– Inflexion point from Grow to Degrow at Global scale level.

Proposing to Renaturation the polders as wetlands by restoring the courses of the old meanders and replacing the inner dykes space in the polders as canals with wetland landscape works. Depending on how the population assimilates the new measures, smaller channels on the property boundaries propose to delimit areas with the same agricultural culture. Changing the cultures will develop communities inside the polders for ecological agriculture without pesticides replaced with temporal land floodings.

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[71] Dițoiu Nina- Cristina, Extras pagini propunere brevet șindrilă fotovoltaică integrate ca Anexă în lucrarea de absolvire curs post- universitar „RoLivingFuture Design Research„ Plan de afaceri, 2022", dizertație finalizare Program de formare antreprenorială, Program postuniversitar de perfecționare, Titlul proiectului: Competențe antreprenoriale și cercetare de excelență în programele de studii doctorale și postdoctorale– ANTREDOC; Cod proiect: POCU/380/6/13/123927;

[72] Droege, Peter– op. cit., Droege, Peter– Ed., "Urban Energy Transition Renewable strategies for cities and regions," Elsevier, 2018, pp. 3-49, 85-113;

[73] Erica Honeck, Arthur Sanguet, Martin A. Schlaepfer, Nicolas Wyler, Anthony Lehmann, "Methods for identifying green infrastructure," S.N. Applied science 2020, https://link.springer.com/article/10.1007%2Fs42452-020-03575-4;

[74] Valeria Superti, Cynthia Houmani, Claudia R. Binder, "A systemic framework to categorize Circular Economy interventions: An application to the construction and demolition sector," Resources, Conservation and Recycling, Volume 173, October 2021, 105711, "Research and Realize" category from the RISE framework;

[75] Renaturare poldere Zerind, Tamasda, S.C. Aqua Prociv Proiect: schiță concept arh. Dițoiu Nina- Cristina; coordonator specialități, consultant specialitate ing. Dan Săcui;

Canals on property boundaries will provide access to water during dry periods (irrigation) and minimal protection against crop flooding during rainy periods. Nature-based solutions address various challenges, from food security to natural disaster risks. Among the benefits of wetlands, we can mention the increase in biodiversity, the expansion of carbon storage, the restoration of the water reserve, the protection against floods and drought, and the ecological agriculture as seen in these polders.

The concept sketch for the two polders with measures noticed in the legend are the relevant works proposed: 1. watercourse; 2. polder boundary dyke with internal polder contour channel; 3. old channel rehabilitated; 4. old internal polder dike abolished and arranged as a canal with wetland area landscape; 5. agricultural landscape inner polder.

4.3 TERRITORY/ NATURAL+ BUILT+ ENERGY, Green- blue infrastructure: Renaturation of Zapodie watercourse, Cluj county- thesis chapter 3.4.3[76]

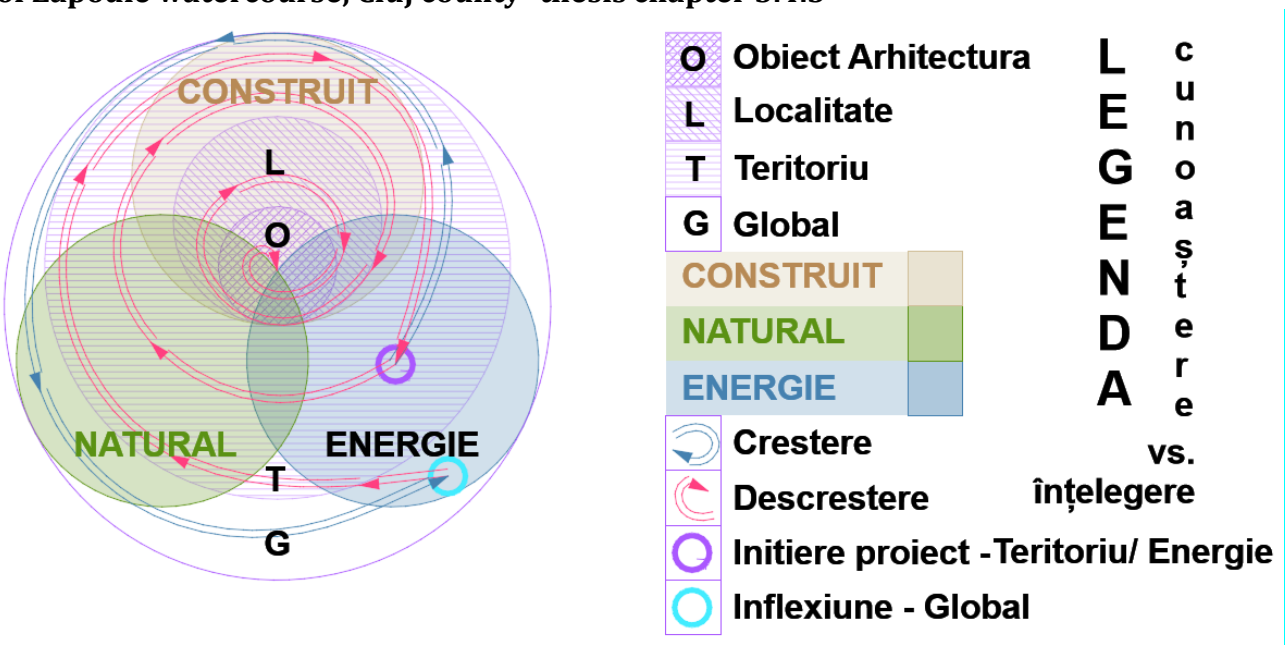

Figure 4.3.1 Knowledge versus Understanding, Legend O- architecture Object; L- Locality; T– Territory; G- Global/ N Natural- Nature+ C Construit- Built+ E Energie– Energy/ Creștere- Grow; Descreștre– Degrow; Inițiere proiect– Starting point in TERRITORY/ENERGY area; Inflexiune Global– Inflexion point from Grow to Degrow at Global level.

Project for the implementation of sustainable development objectives with the contribution to the field of ENERGY domain- The study proposes a bicycle route to visit the archaeological heritage along the watercourse with the insertion of flexible photovoltaic panels; NATURAL domain- Development of a wetland in stages with pollution reduction through biological self- purification and dilution. It proposes to set up a wetland/ flooded area with the increase of the space related to the watercourse, contribution to the addition oN biodiversity, the pollution area proposed for decontamination with specific protection measures (the curtain of tall vegetation for areal stabilization, the site of ecological reconstruction). Thus, the arrangement of the watercourse as a permanent wetland and arrangement of a flood zone (non-permanent wetland area with biodiversity input, green-blue infrastructure corridor/ wildness corridor proposal).

[76] *Studiu de soluție Amenajare valea Zapodiei, Cluj, Prezentare powerpoint studiu proiect, S.C. Aqua Prociv Proiect, arh. Dițoiu Nina- Cristina, consultant ing. Dan Săcui;*

The proposal for the permanent wetland appears to be developed in phases as follows: PHASE I- landscape with macrophyte pools for greening; PHASE II- pools with macrophytes partially abolished naturally following the greening of the watercourse; PHASE III- former collections with macrophytes abolished become areas of crossings set up for the local population.

Some basins will be vegetated/forested, and others will be set up by involving the local people and volunteers from the academic environment in learning workshops and transmitting the principles of the circular economy, capitalizing on resources from the circular economy– the BUILT field.

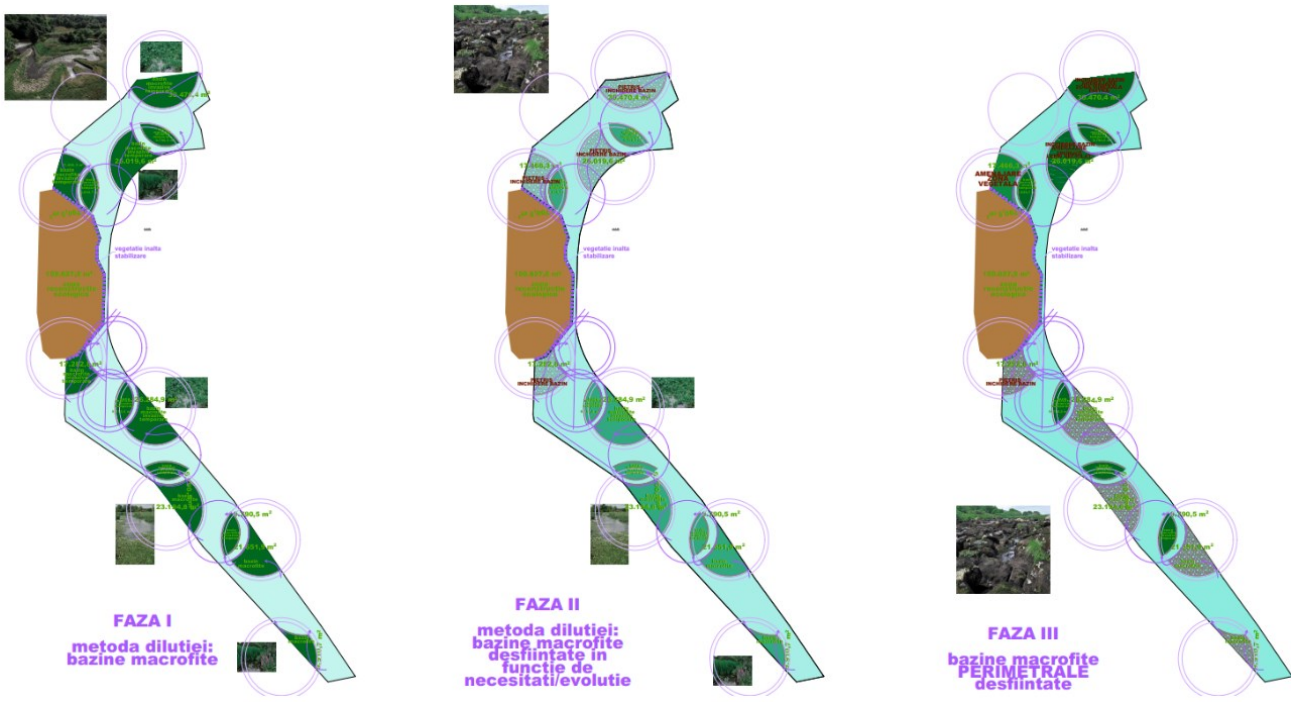

Figure 4.3.2 Valea Zapodie landscape, Cluj, stages in the wetland development[77], detailed PHASE I- PHASE II- PHASE III.

4 RESULTS

4.1 ORIGINAL CONTRIBUTION

The methodology of going through the criteria of Knowledge through the double senses spiral of Understanding is the original substantive contribution with its application to case studies. The case studies from the personal portfolio of works are also original contributions. The vast Territory of the case studies, from the micro scale to the macro scale and the natural transition from one scale to another, is an original contribution, and through the multidisciplinarity of the themes (hydraulic engineering with the arrangement of watercourses, photovoltaic Energy applied to case studies at different scales and from various fields, environmental measures, and biodiversity which has become paramount in safeguarding climate change). The way of achieving the documentation related to the research stage through conferences and online courses is original or just atypical for research, also forced by the vast related fields that could not be reached only through the level of collaborators in the professional life of current practice.

[77] *Studiu de soluție Amenajare Valea Zapodiei, Cluj, op. cit;*

4.2 DISCUSSIONS

The areas covered by the Knowledge criteria and the case studies are so vast that they exceed a 'classical' Ph.D. level, with the Knowledge developed focused, in detail, on a narrow area. It is an atypical way of transitional doctoral research, with limited primary sources, documentation made through conferences and courses, primarily online, but of high quality, a form of traversing at the academic level an explosive level of Knowledge related to our times. It may be a paradigm shift to a successful new way of doing research at a holistic level towards the third enlightenment or a failure of related research to focus on the "bacteria" of human innovation - the beginning of the "post-intelligent design" era. Dennett in "From Bacteria to Bach and Back, The Evolution of Minds"- it's Bach. However, it could be that Turing, Picasso, Einstein, and Shakespeare all represent a pinnacle of intelligent design, peaks reached by Darwin's detailed evolution of the human species, following an "inflection" towards an involution of the human species. The research is based on practical multidisciplinary case studies completed as research with emphasis on philosophy-phenomenology, according to a previously detailed methodology. The case studies are from different fields, analyzed at various scales with transitions from one scale to another and according to criteria from other areas (BUILT, NATURAL, ENERGY). Thus, an extension was reached from traditional vernacular architecture to contemporary iconic bioclimatic architecture to solution studies with collaborations in the hydro-technical field of watercourse development, with details of wetlands related to the BUILT metaphor.

To integrate the NATURAL metaphor, environmental measures from the E.U. taxonomy and actions for biodiversity associated with climate change were applied through proposals for regenerative developments. Where possible, recommendations to integrate photovoltaic Energy with calculating the solar energy production potential for early phases of preliminary design involved to the case studies related to the ENERGY metaphor. Evaluate ENERGY. The photovoltaic technology was estimated through detailed case studies in the related chapter OBJECT of architecture with early evaluations, preliminary design level, evaluations that allow in the case of the replicable architecture of a traditional village a transition to urban scale through assessments of available surfaces to be provided with such technology. For the LOCALITY/TERRITORY scales, measures related to a mosaic of colors were proposed: gray (waterproof)/brown (polluted) color was used for the built frame, and mosaic related to a locality to be able to intervene on them with ENERGY measures (covering with the photovoltaic surface, the input of renewable Energy) or actions in the NATURAL field (covering with green surfaces, input as biocapacity/biodiversity or just drainage to take over the surplus water and restore the water reserve of the land for a locality designed with permeable surfaces to renaturations through "sponge" type development).

5 ORIGINAL CONTRIBUTIONS

The originality of this research can be divided into the uniqueness of the methodology and the creativity of the case studies to which the procedure was applied.

The case studies have a related original part through the proposed solutions.

Also original is the documentation method for the current state of research in a field, extroverted towards vast fields and not punctual, introverted, in a well-defined and mastered area. Expanding the domain involves including and assuming error or "non-deterministic" probability, where we associate determinism with known causal events.

5.1 GENERAL CONCLUSIONS

The conclusions can be divided into domains and work scales. Scale OBJECT architecture- Recommendation for a bioclimatic architecture, architecture that involves adaptation to the environment, both through passive measures and through elements with the adoption or optimization of technologies that require adaptation to environmental conditions, the result being the conception of the design of a building, taking into account holistically of all constraints for adaptation to climate change, without adversely affecting aesthetics or heritage, humanistic values. Passive measures can be those related to the orientation of the building that can bring solar input for heating or ensure optimal natural lighting for a specific function, natural ventilation or improve the well-being of users through a biophilic design with the integration of NbS- nature-based solutions with indigenous species chosen based on local environmental conditions.

In bioclimatic architecture, in addition to passive measures, technologies that require optimization according to ecological conditions, ventilation and lighting, solar panels (photovoltaic/heating), heat pumps, or wind energy production systems are included and taken over. The TERRITORY scale consists of the three domains with the efferent criteria of Knowledge (NATURAL– NbS+ BUILT– culture+ ENERGY– renewables) in an attempt at a holistic approach to all relevant domains.

The conclusions on the Natural/ Built/ Energy domains tend towards a network approach to them by going through at least two other scales compared to the project initiation scale, as follows: for the LOCATION scale, the TERRITORY scale will be additionally traversed in order to connect the proposed measures to the scale relevant to the field, whatever that may be, but measures will be imposed for the OBJECT scale, necessary to be taken over for the operation of a whole, that of the Regeneration of a culture of the built environment, towards a regenerative culture that will develop more or more little regardless of the starting point and we cannot predict exactly where and how it will look.

5.2 DISSEMINATION

There is a patent documentationt, on the photovoltaic wooden shingle, that is desired to be obtained; patent documentation started within the ANTREDOC program Project code P.O.C.U./380/6/13/123927, it is expected to be associated with related technical research in a project of subsequent multidisciplinary research.

There is also a list of publications attached to this work that has already been registered in various databases; some journals with support at scientific conferences are already published open-source as it appears in the "List of publications."

Almost every project started, some unfinished, can be developed as independent research with a focus on a field related to a case study.

5.3 FUTURE DIRECTIONS

The two-senses spiral of Understanding trough the Knowledge on the domains represented metaphorically by Natural, Built, Energy can be expanded from case to case, depending on the context through additional columns, through risk assessment with a jump from a scale to another, through extending domains represented metaphorically, the rosette with the simplest representation (3 metaphors/ 3 petals) can be expanded with the Virtual domain and the treatment based on AI based software, or the Global scale could be found as a network at the level Global with doubling to an Archetypal scale of the basic principles applicable on a Global level, or a Solar scale of the solar system with the inclusion of planets if there will be an Alens future.

The spiral of Regeneration with expansion towards the macro level, much more plausible in the near future is the expansion towards the micro level, from architectural Object of a plot or a related space, contraction/decreasing towards the ecological microsystem, of bees or other living beeings that will become relevant in a post-Anthropocene, the development of a column in the criteria list for fungi as a criterion in the soil column of the Natural domain. The flexibility of the model allows its development in future directions that are now unknown to us. Developing in a world where Knowledge and access to Knowledge has achieved a level that exceeds the level of assimilation possibilities of the human being, the achievement of Understanding based on them becomes relevant. A fairly simple algorithm could transform the double senses spiral methodology of Understanding into an AI assimilated DDS- Decision support system- software to aid human Understanding.

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