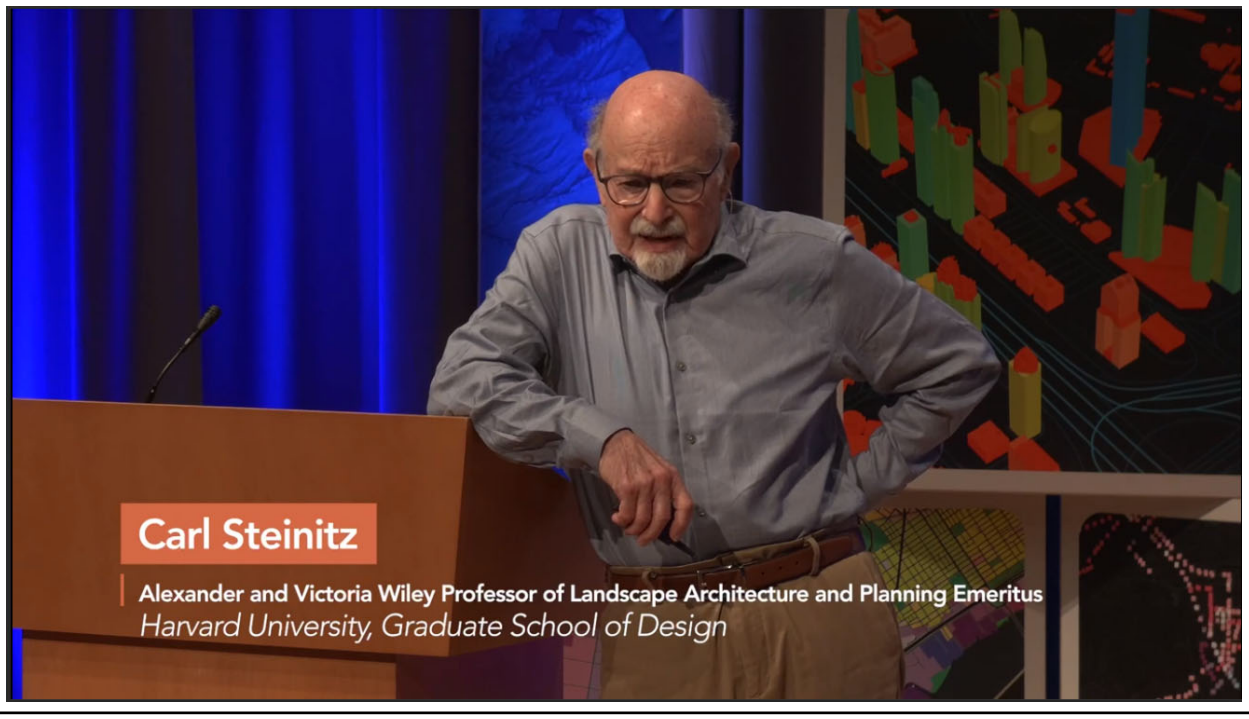
Geodesignの展開
ー意思決定支援のためのデータ統合ー

村上暁信（筑波大学）

1



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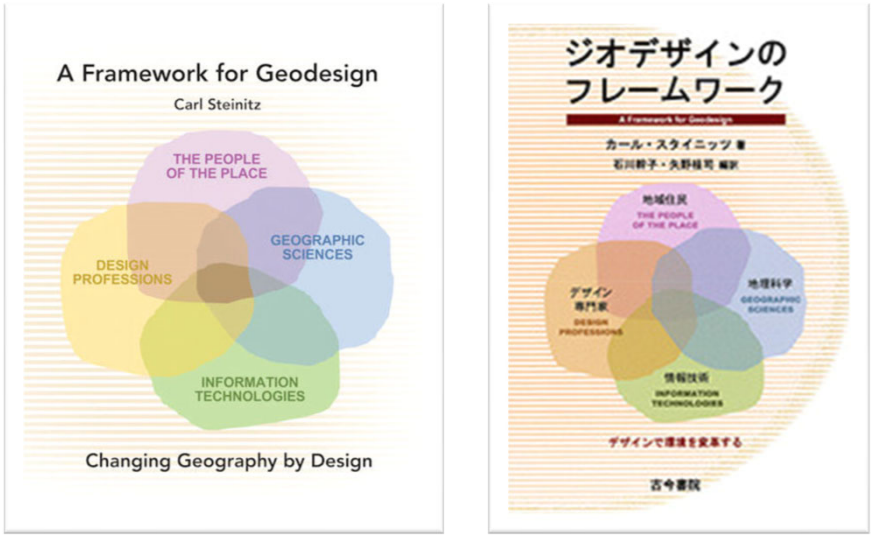
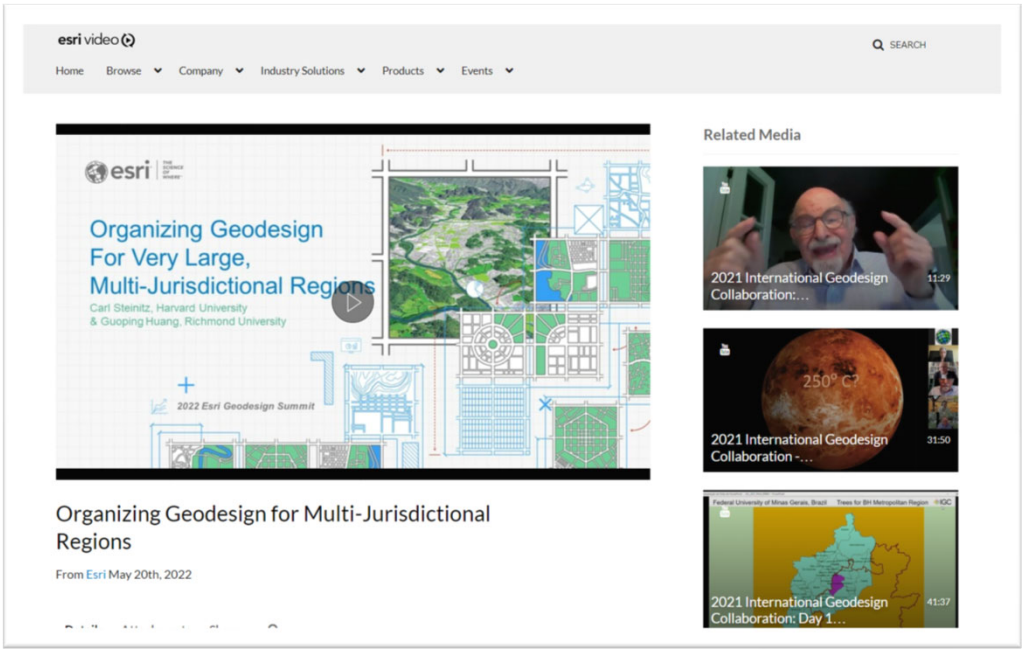

A Framework for Geodesign
Carl Steinitz
THE PEOPLE OF THE PLACE
GEOGRAPHIC SCIENCES
DESIGN PROFESSIONS
INFORMATION TECHNOLOGIES
Changing Geography by Design
ジオデザインの
フレームワーク
カール・スタイニッツ 著
THE PEOPLE OF THE PLACE
GEOGRAPHIC SCIENCES
DESIGN PROFESSIONS
INFORMATION TECHNOLOGIES
デザインで環境を変革する
古今書院

3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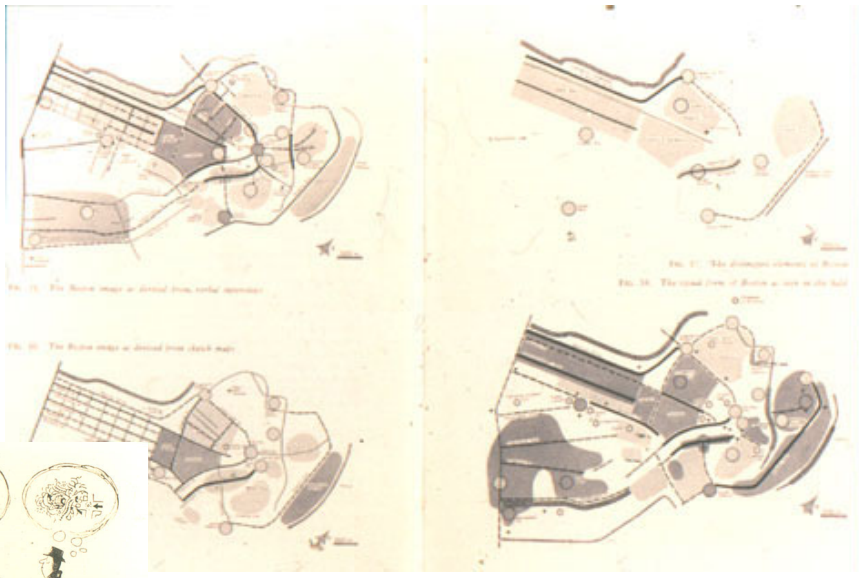
Organizing Geodesign For Very Large, Multi-Jurisdictional Regions
Carl Steinitz, Harvard University
& Guoping Huang, Richmond University
2022 Esri Geodesign Summit
Organizing Geodesign for Multi-Jurisdictional Regions
From Esri May 20th, 2022
Related Media
2021 International Geodesign Collaboration:…
11:29
250° C?
2021 International Geodesign Collaboration -…
31:50
2021 International Geodesign Collaboration: Day 1…
41:37

4

Kevin Lynch (1918-1984)



5

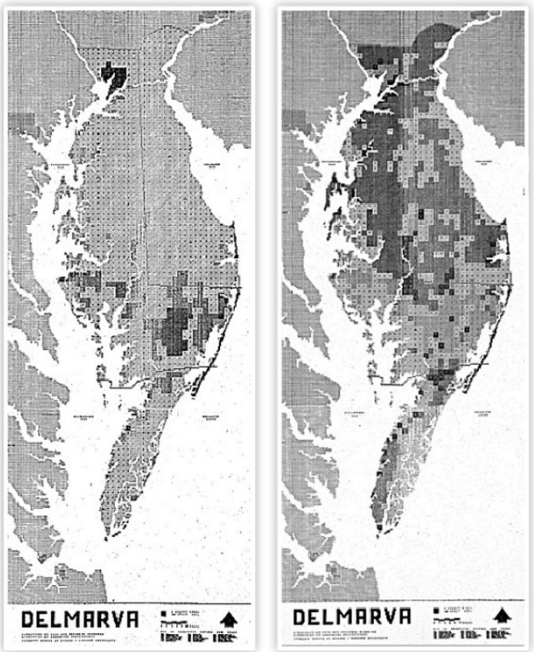
Howard Fisher (1903-1979)

◎ 地理学者　デジタル地図製作者
　建築家　都市計画家

◎ 景観解析プログラム SYMAP を開発
　（1964 年）

◎ ハーバード大学デザイン・スクールで
　コンピュータ・グラフィックスと
　空間解析の研究室（LCGSA）を設立
　（1965 年）

◎ 初めてコンピュータを用いた地域計画
　（デルマーヴァ計画）を作成



Steinitz, C. (2010). Re

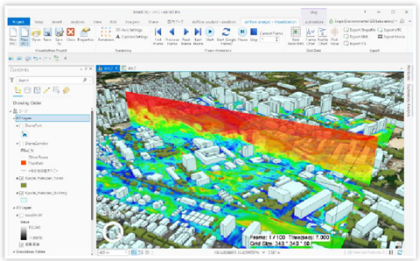
nnings of Geoesign: a personal historical perspective. Research in Urbanism Series, 4, 9–24.

6

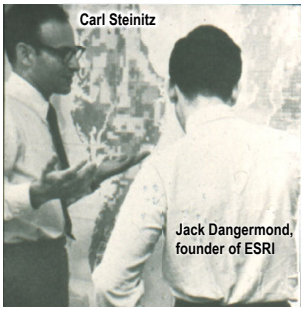
Jack Dangermond

1969年にEnvironmental Systems Research Institute（Esri）社を設立

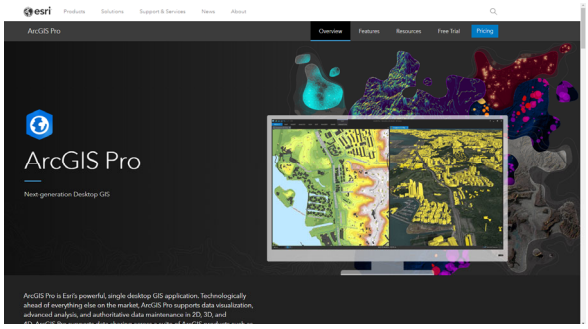
ArcGIS Info



ArcGIS Pro

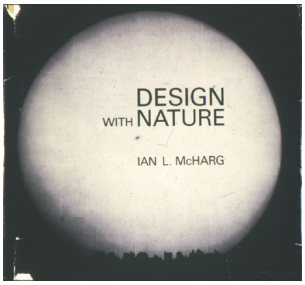


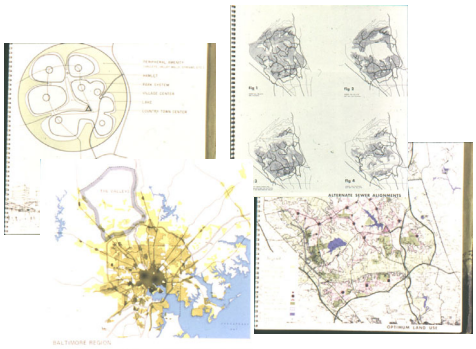
esri THE SCIENCE OF WHERE

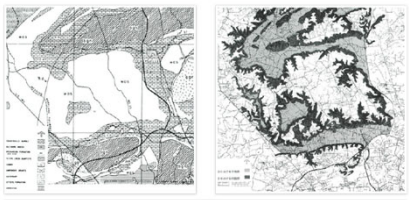


7

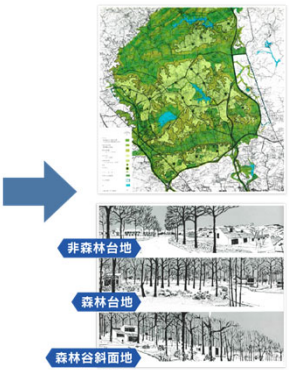
Ian L. McHarg (1920-2001)





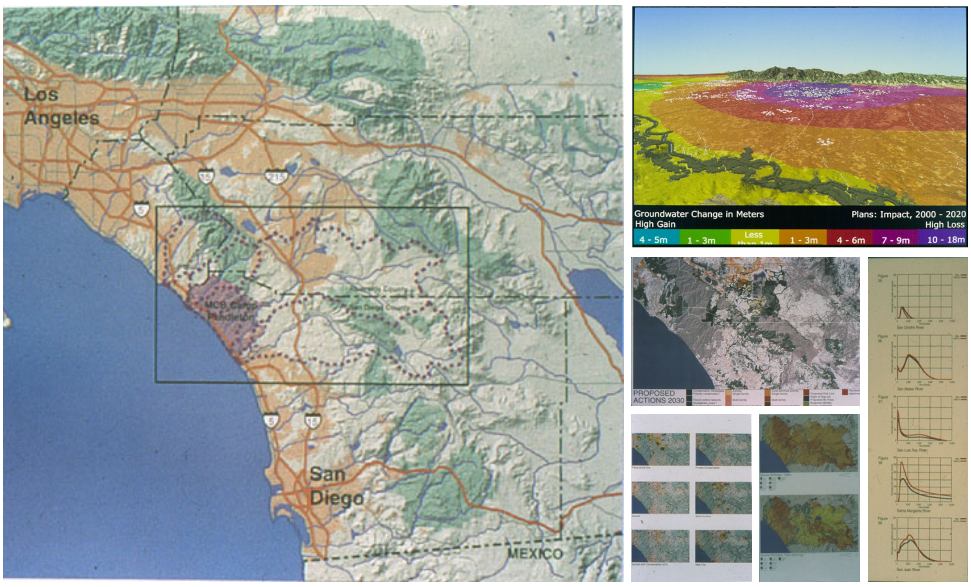


自然地理形態断面



8

Carl Steinitz　alternative futures for…



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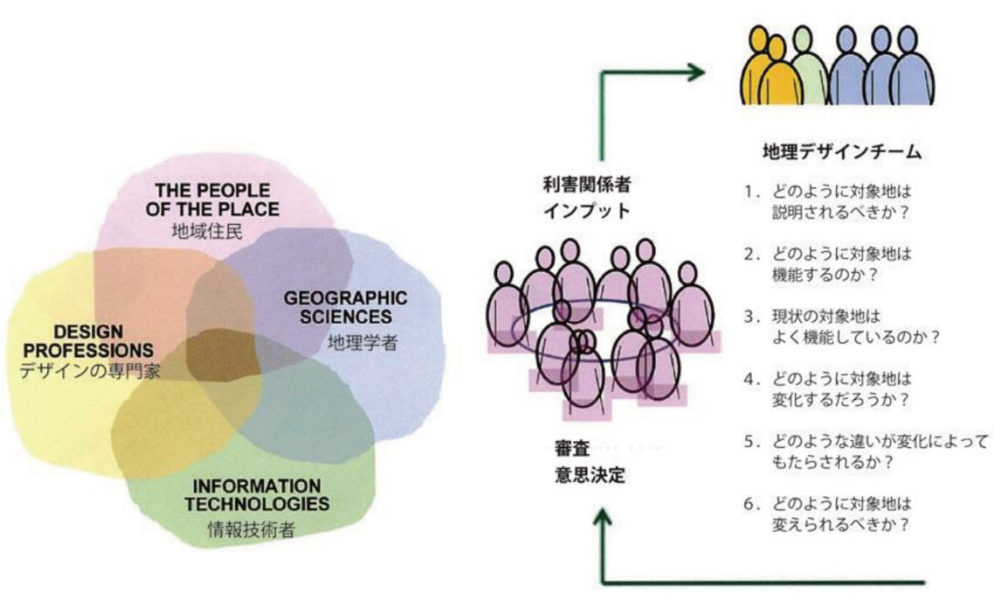


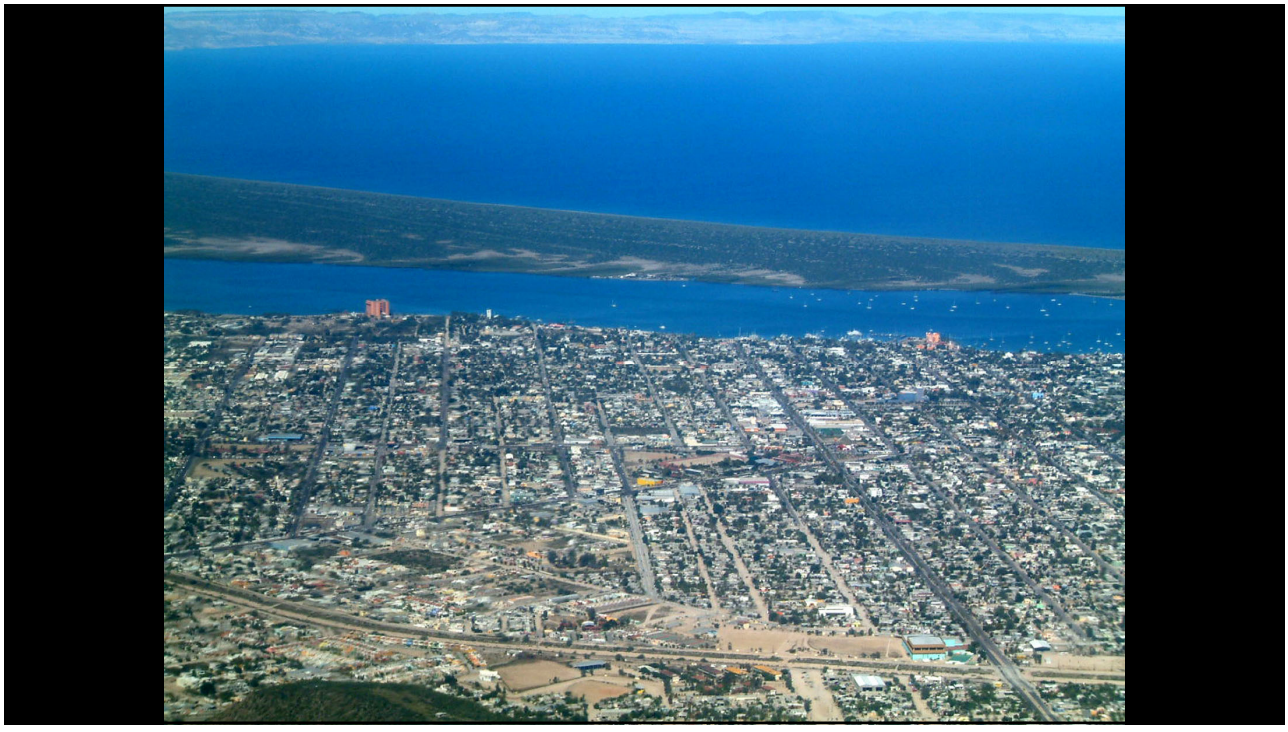
10

Alternative Futures for the Region of La Paz BCS Mexico

11

12

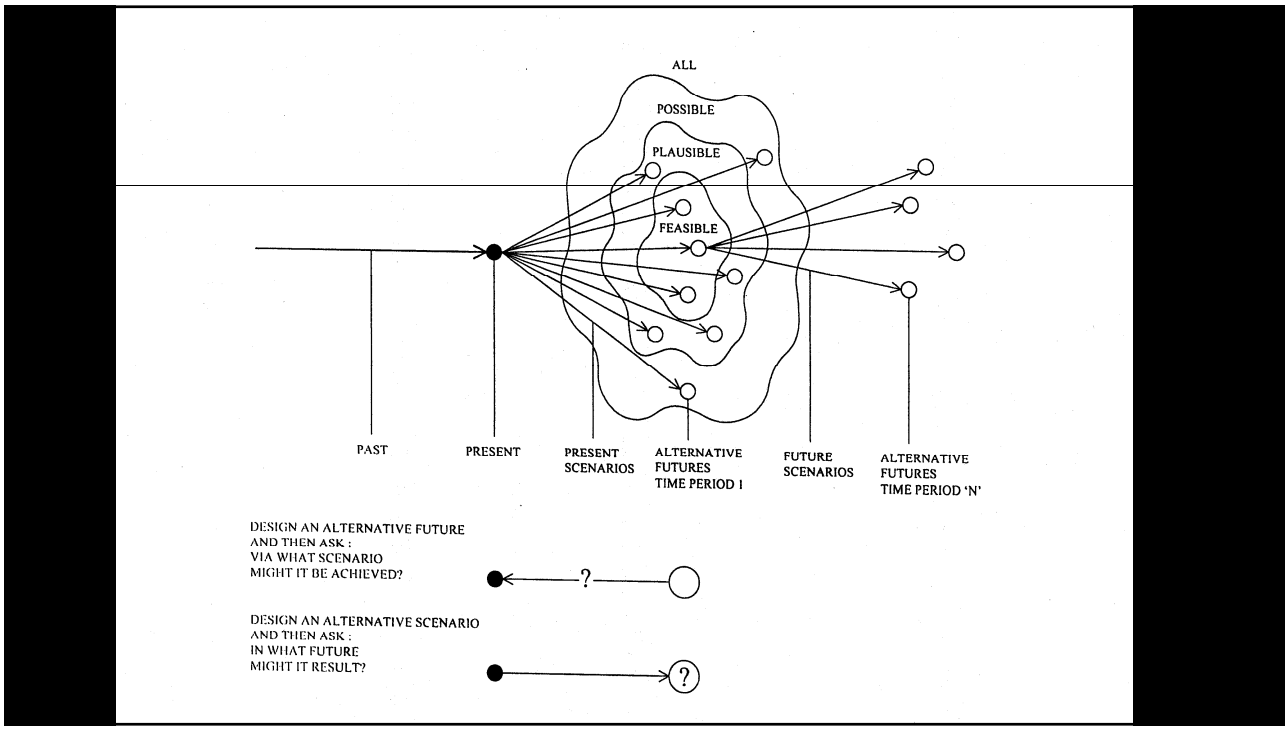
13



14

15

16



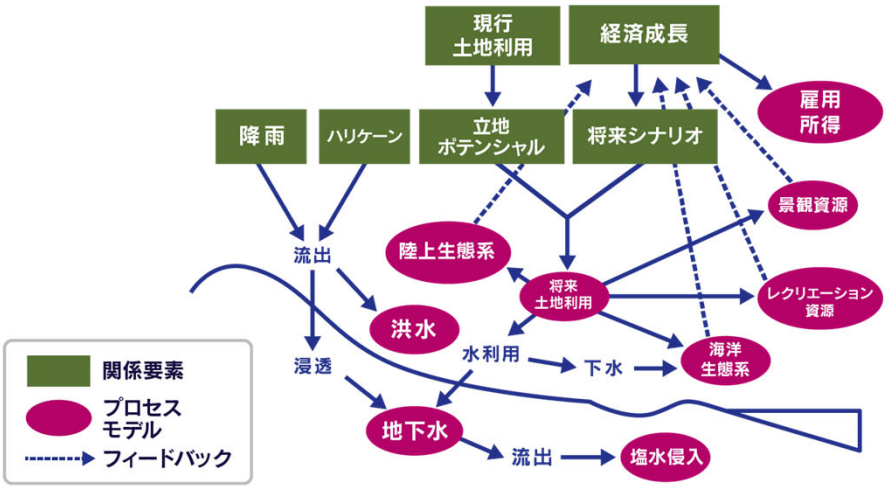
17

ジオデザイン　6つの問いかけ

1. ランドスケープの現況は 構成要素 空間 時間の各点において どのように記述されるか？
2. ランドスケープはどのように作用しているのか 構成要素間にはどのような機能的・構造的な連携が存在するのか？
3. ランドスケープは現在適切に機能しているのか？
4. ランドスケープはどのような政策や事業によってどのように変化するか その変化はいつどこで生じるか？
5. 変化はいかなる差異を生じるか？
6. 将来どのようなランドスケープへと導いていくべきか？

18

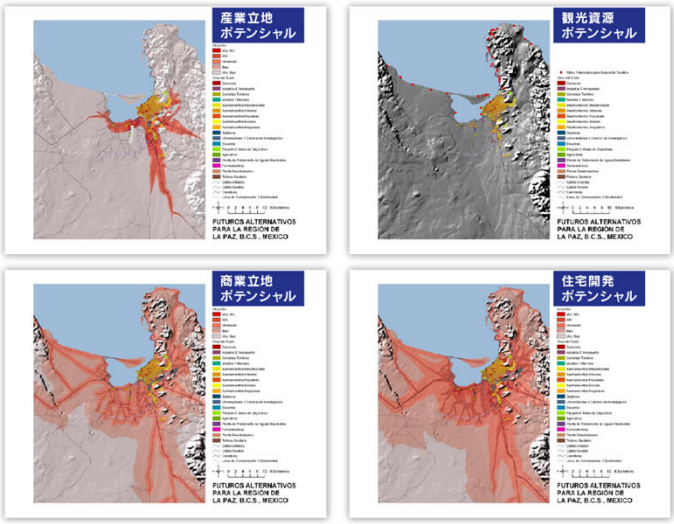
② ランドスケープはどのように作用しているのか 構成要素間にはどのような機能的・構造的な連携が存在するのか？



資料提供：Carl Steinitz

19

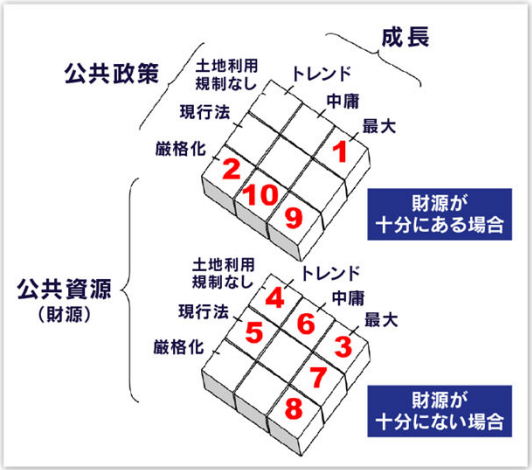
③ ランドスケープは現在適切に機能しているのか？

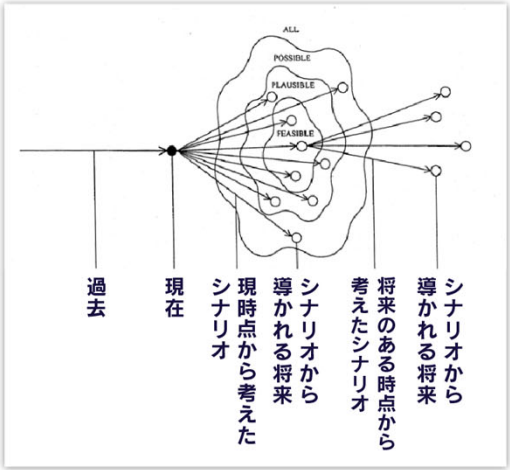


資料提供：Carl Steinitz

20

④ ランドスケープはどのような政策や事業によってどのように変化するか その変化はいつどこで生じるか？

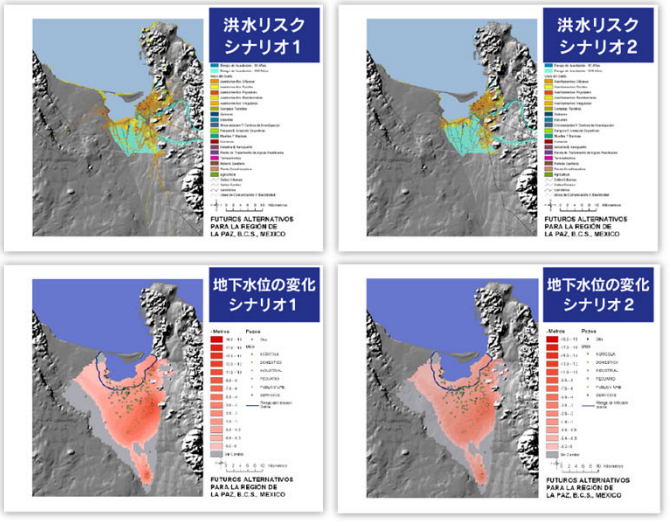


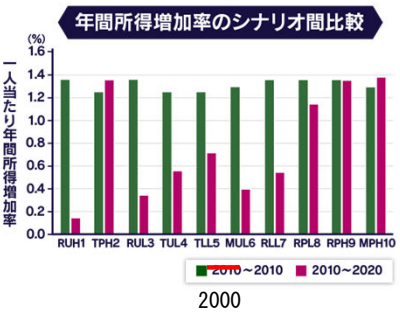


画像提供：Carl Steinitz

21

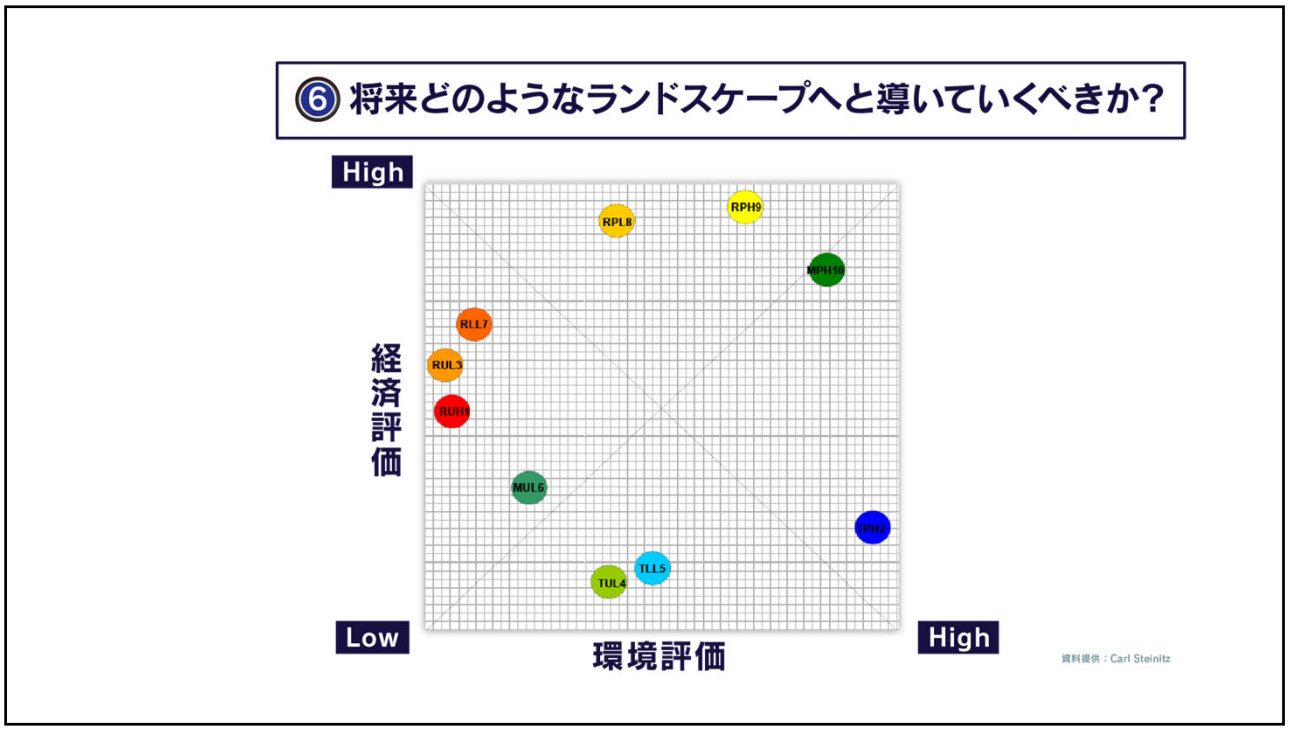
⑤ 変化はいかなる差異を生じるか？



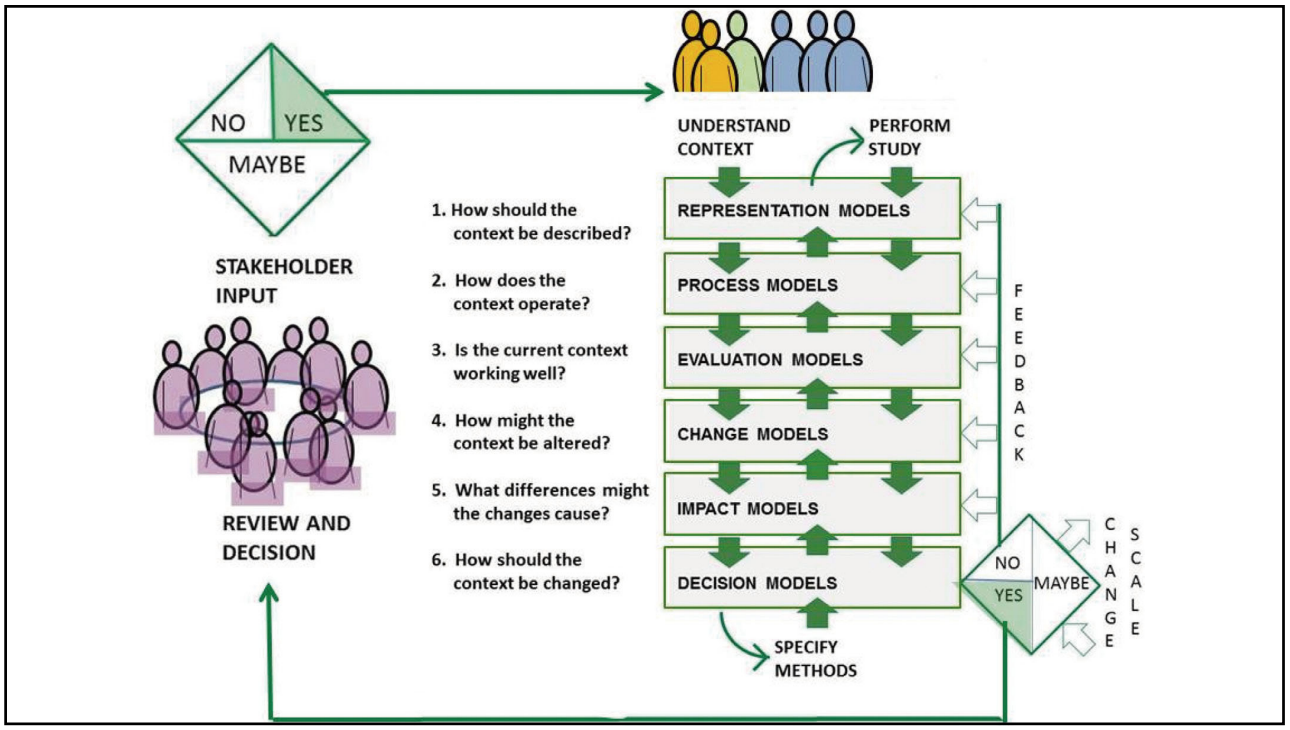


資料提供：Carl Steinitz

22


⑥ 将来どのようなランドスケープへと導いていくべきか？
High
Low
経済評価
環境評価
High
RPL8
RPH9
MPH10
RLL7
RUL3
RUH1
MUL6
TPH2
TLL5
TUL4
資料提供：Carl Steinitz

23


NO
YES
MAYBE
STAKEHOLDER INPUT
REVIEW AND DECISION
1. How should the context be described?
2. How does the context operate?
3. Is the current context working well?
4. How might the context be altered?
5. What differences might the changes cause?
6. How should the context be changed?
UNDERSTAND CONTEXT
PERFORM STUDY
REPRESENTATION MODELS
PROCESS MODELS
EVALUATION MODELS
CHANGE MODELS
IMPACT MODELS
DECISION MODELS
SPECIFY METHODS
FEEDBACK
NO
YES
MAYBE
CHANGE SCALE

24

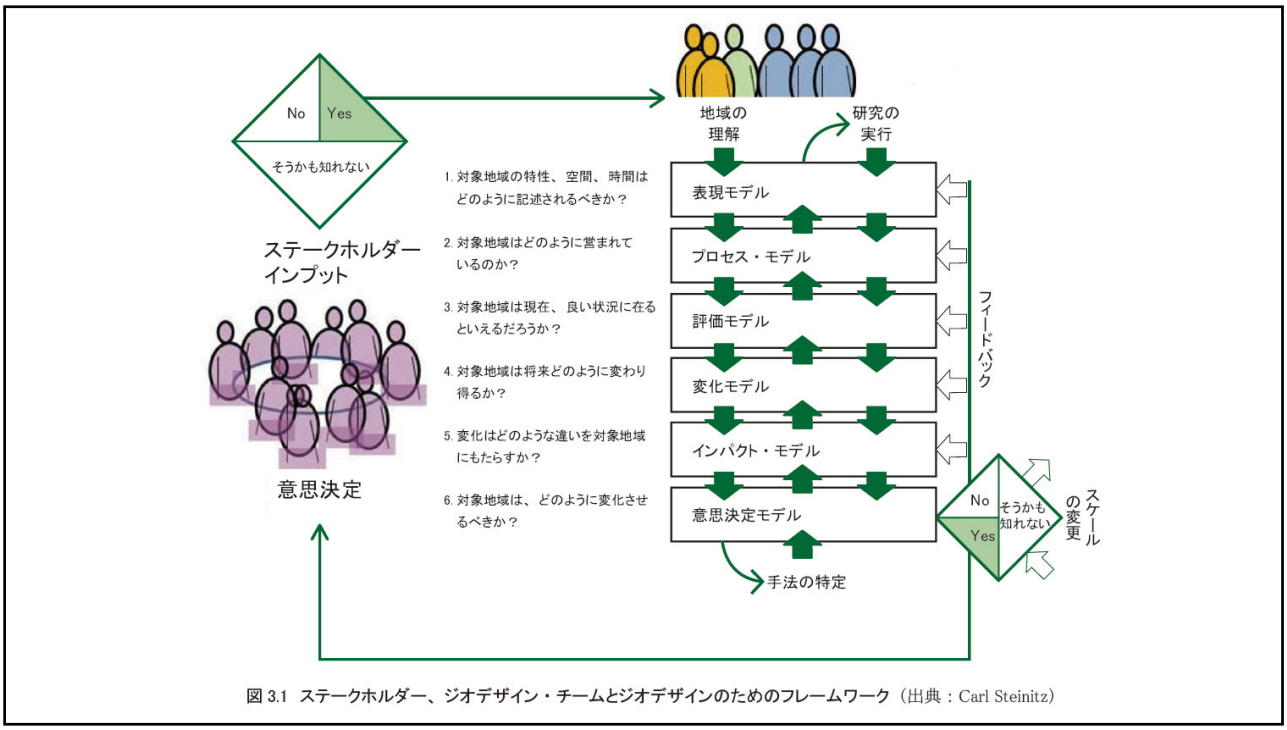
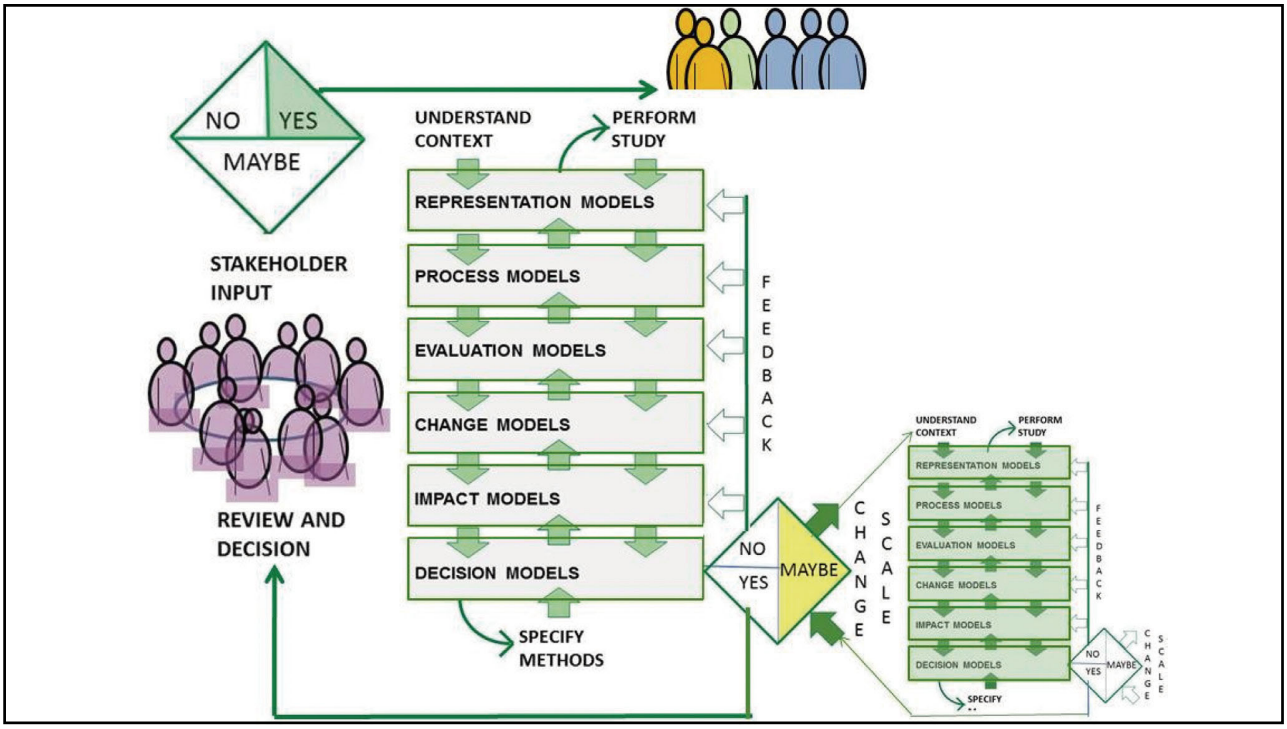


図 3.1 ステークホルダー、ジオデザイン・チームとジオデザインのためのフレームワーク（出典：Carl Steinitz）

25



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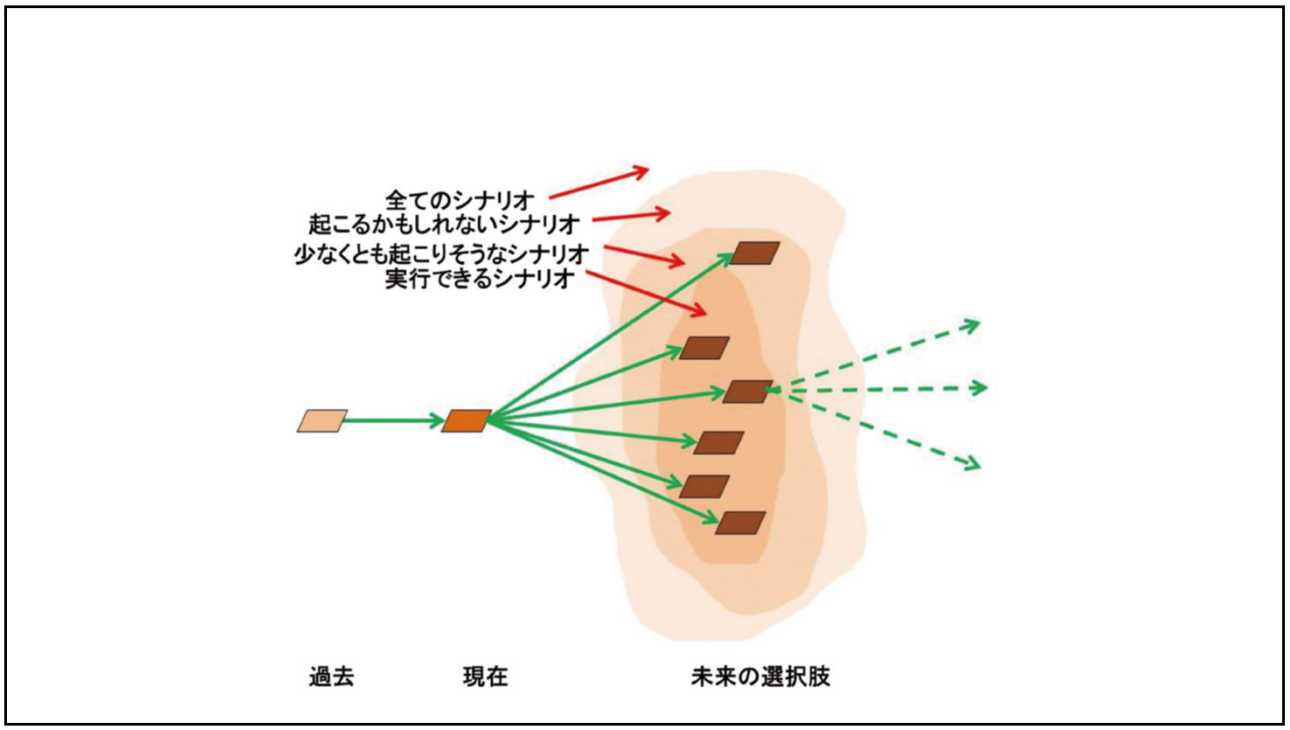
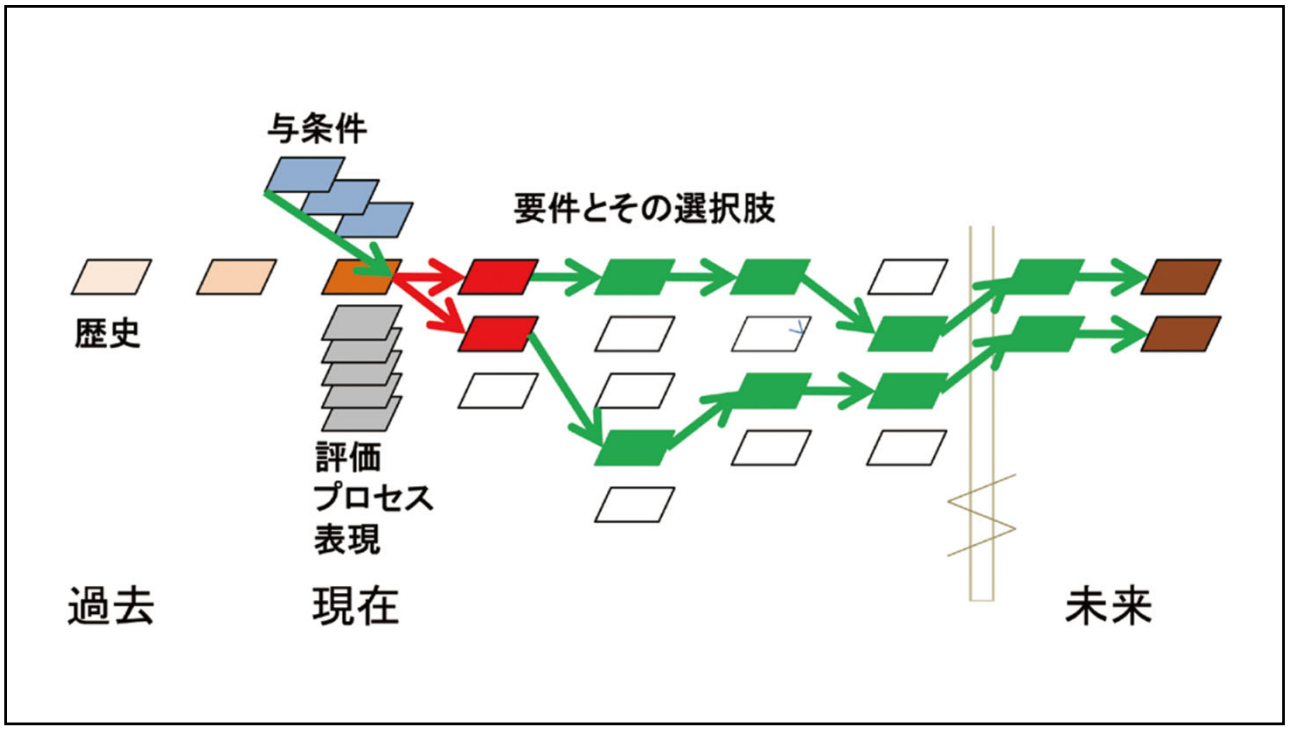
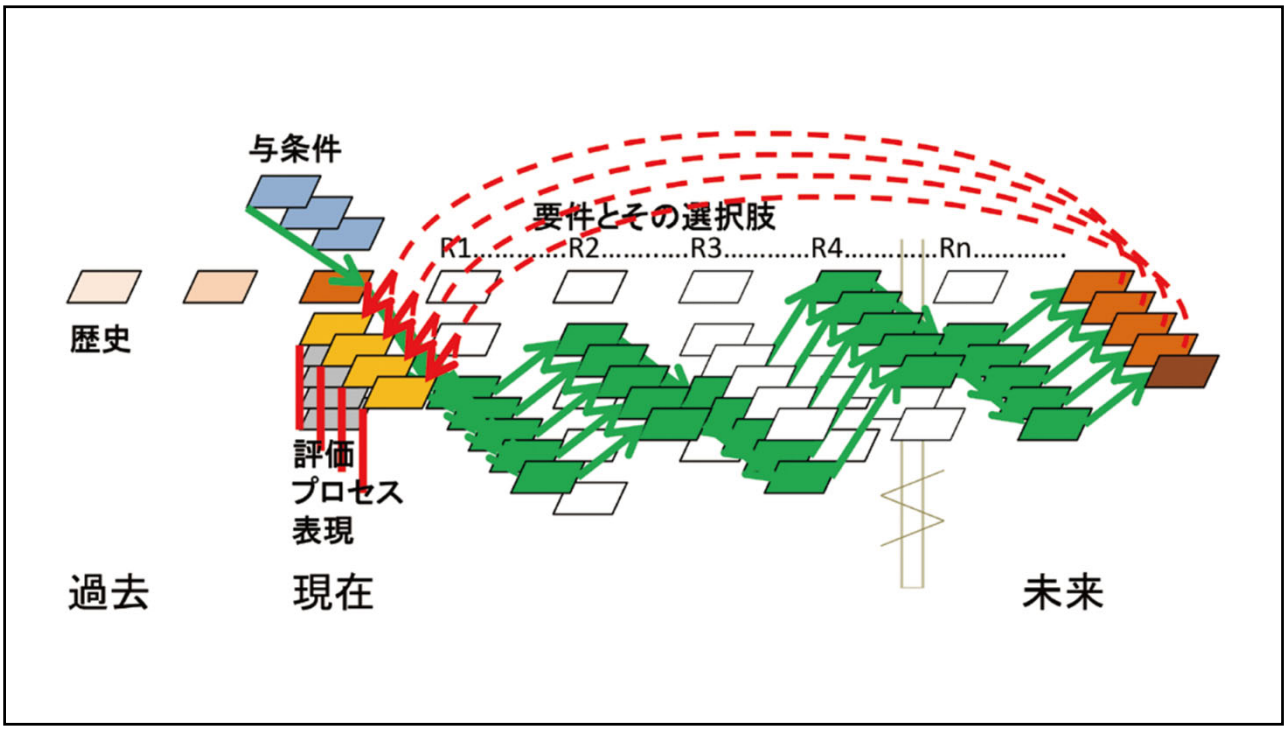

全てのシナリオ
起こるかもしれないシナリオ
少なくとも起こりそうなシナリオ
実行できるシナリオ
過去
現在
未来の選択肢

27


与条件
要件とその選択肢
歴史
評価
プロセス
表現
過去
現在
未来

28



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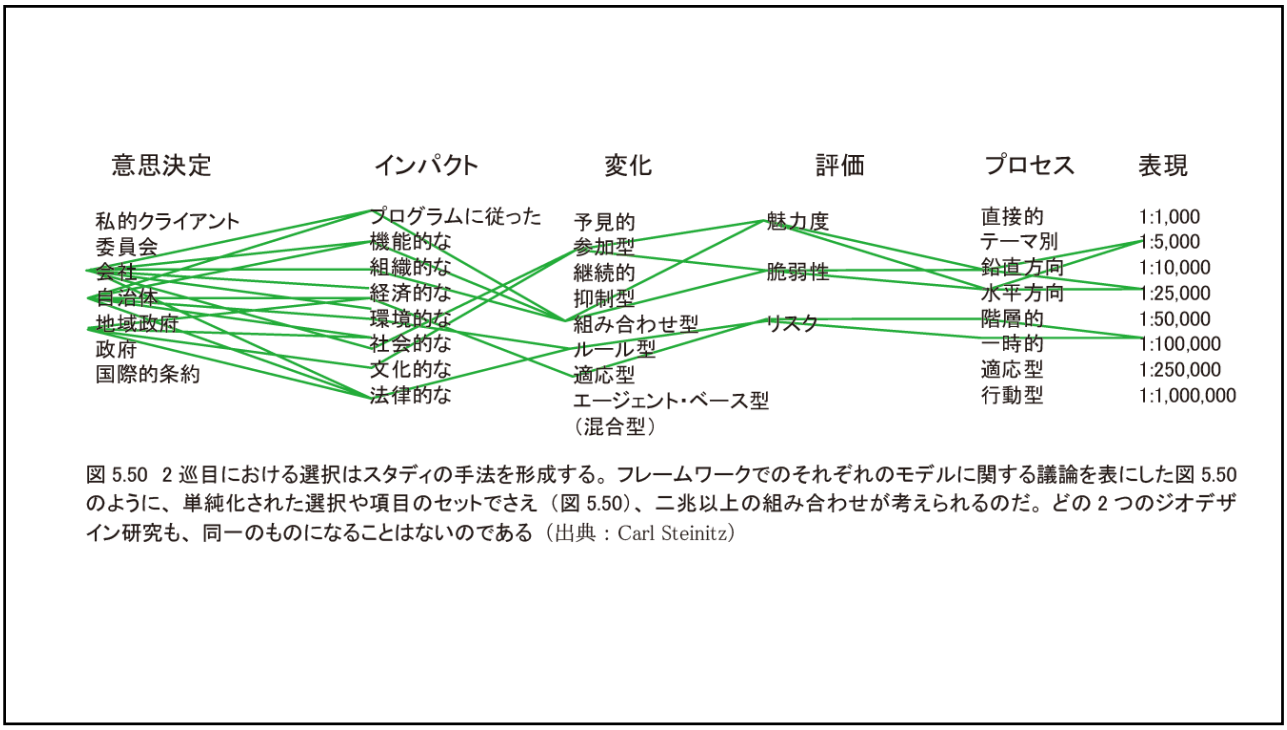
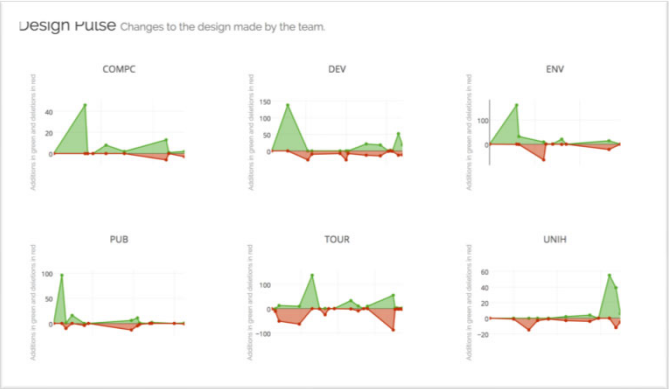


図 5.50　2 巡目における選択はスタディの手法を形成する。フレームワークでのそれぞれのモデルに関する議論を表にした図 5.50 のように、単純化された選択や項目のセットでさえ（図 5.50）、二兆以上の組み合わせが考えられるのだ。どの 2 つのジオデザイン研究も、同一のものになることはないのである（出典：Carl Steinitz）

30

"Geodesignhub presents an innovative, sophisticated, and powerful technology to generate consensus for your making decisions in your project."

"Geodesignhub enables project managers and senior administrators engage with project stakeholders and organize sophisticated digital negotiations."



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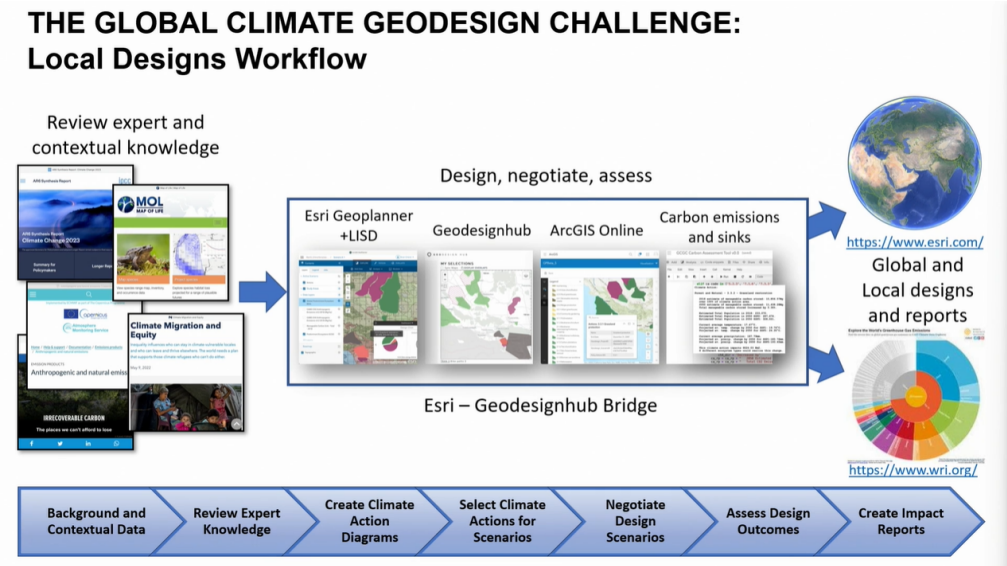
THE GLOBAL CLIMATE GEODESIGN CHALLENGE

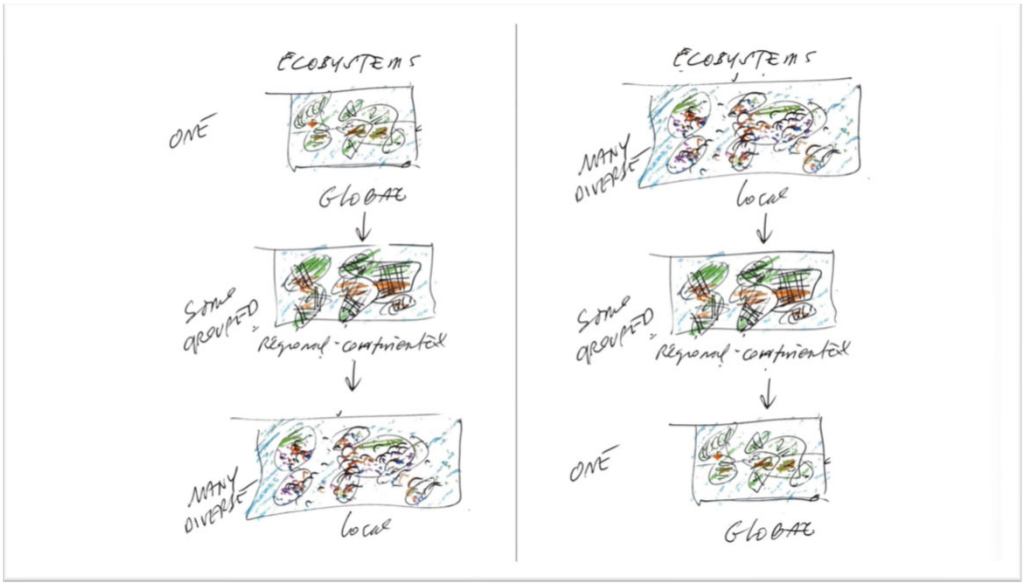
Planet Earth is the most important geodesign problem. Global climate conditions are changing in fundamental ways, greatly impacting all global communities today and in their futures. The International Geodesign Collaborative (IGC), together with the Liechtenstein Institute for Strategic Development GmbH. (LISD) and Geodesignhub Pvt. Ltd. in partnership with and sponsored by Esri Inc., have launched the Global Climate Geodesign Challenge.

This multi-year, science-based geodesign project aims at reversing climate change. We are developing science-based tools and geodesign methods that address the major implications of climate change – by negotiating and applying climate-related actions to reduce excessive atmospheric greenhouse gas concentrations via emission reduction and carbon storagre enhancement. This will increasingly be essential aspect of all scales of present and future planning. We are presenting it today in its very first test phase. We expect to apply it this Fall in a large set of local studies, with the aim of making a locally-to-regionally-driven global design early in 2004.

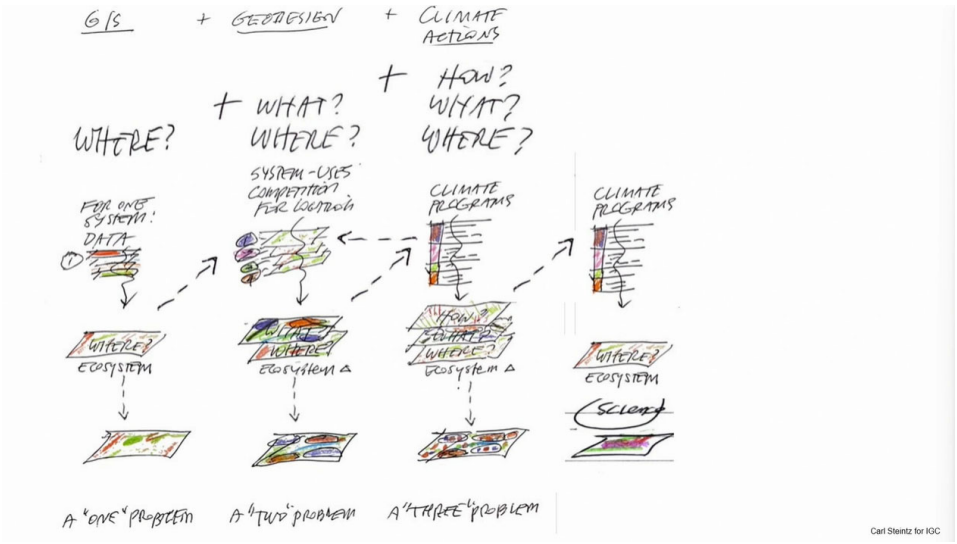
32


THE GLOBAL CLIMATE GEODESIGN CHALLENGE:
Local Designs Workflow
Review expert and contextual knowledge
Design, negotiate, assess
Esri Geoplanner +LISD
Geodesignhub
ArcGIS Online
Carbon emissions and sinks
Esri – Geodesignhub Bridge
https://www.esri.com/
Global and Local designs and reports
https://www.wri.org/
Background and Contextual Data
Review Expert Knowledge
Create Climate Action Diagrams
Select Climate Actions for Scenarios
Negotiate Design Scenarios
Assess Design Outcomes
Create Impact Reports

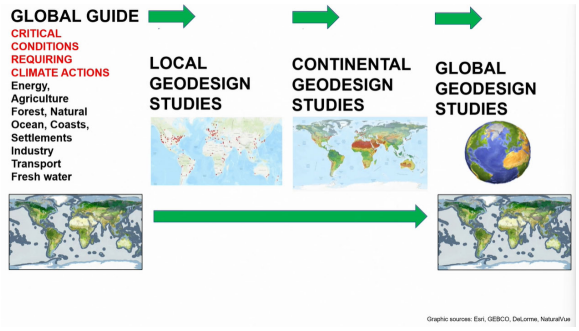
33

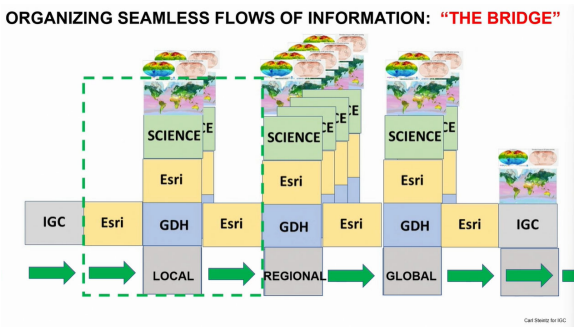

ECOSYSTEMS
ONE
GLOBAL
SOME GROUPED
Regional - continental
MANY DIVERSE
local
ECOSYSTEMS
MANY DIVERSE
local
SOME GROUPED
Regional - continental
ONE
GLOBAL

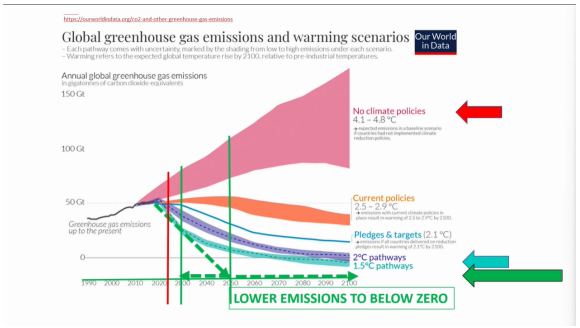
34

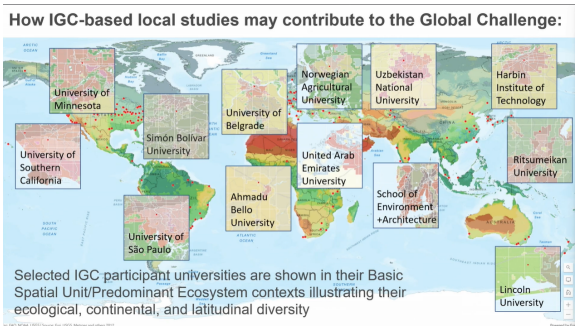

GIS
+ GEODESIGN
+ CLIMATE ACTIONS
+ HOW?
+ WHAT?
WHERE?
WHAT?
WHERE?
HOW?
WHAT?
WHERE?
SYSTEM - USES COMPETITION FOR LOCATION
CLIMATE PROGRAMS
CLIMATE PROGRAMS
FOR ONE SYSTEM:
DATA
WHERE?
ECOSYSTEM
WHERE?
ECOSYSTEM
HOW?
WHAT?
WHERE?
ECOSYSTEM
WHERE?
ECOSYSTEM
(SCIENCE)
A "ONE" PROBLEM
A "TWO" PROBLEM
A "THREE" PROBLEM
Carl Steintz for IGC

35

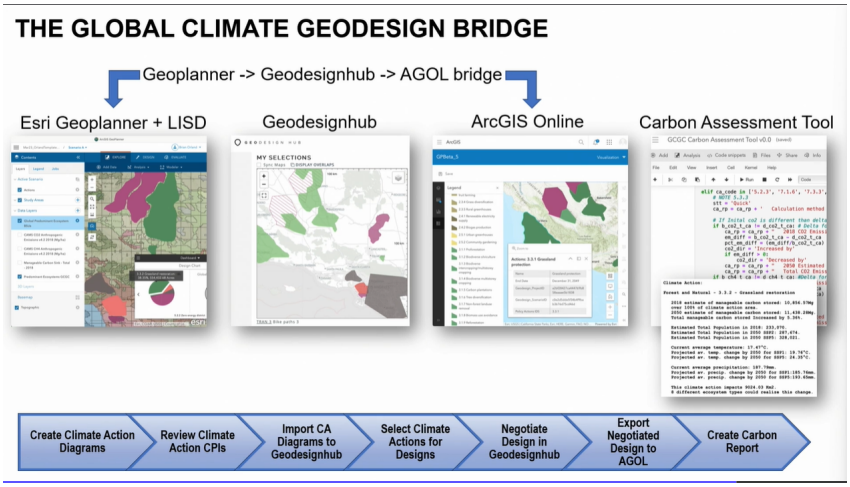

GLOBAL GUIDE
CRITICAL CONDITIONS REQUIRING CLIMATE ACTIONS
Energy,
Agriculture
Forest, Natural
Ocean, Coasts,
Settlements
Industry
Transport
Fresh water
LOCAL GEODESIGN STUDIES
CONTINENTAL GEODESIGN STUDIES
GLOBAL GEODESIGN STUDIES
Graphic sources: Esri, GEBCO, DeLorme, NaturalVue


ORGANIZING SEAMLESS FLOWS OF INFORMATION: "THE BRIDGE"
SCIENCE
Esri
IGC
Esri
GDH
Esri
LOCAL
REGIONAL
GLOBAL
IGC


Global greenhouse gas emissions and warming scenarios
Our World in Data
Annual global greenhouse gas emissions
150 Gt
100 Gt
50 Gt
0
Greenhouse gas emissions up to the present
No climate policies
4.1 - 4.8 °C
Current policies
2.5 - 2.9 °C
Pledges & targets (2.1 °C)
2°C pathways
1.5°C pathways
LOWER EMISSIONS TO BELOW ZERO


How IGC-based local studies may contribute to the Global Challenge:
University of Minnesota
University of Southern California
Simón Bolivar University
University of Belgrade
Norwegian Agricultural University
Uzbekistan National University
Harbin Institute of Technology
United Arab Emirates University
Ritsumeikan University
Ahmadu Bello University
School of Environment +Architecture
University of São Paulo
Lincoln University
Selected IGC participant universities are shown in their Basic Spatial Unit/Predominant Ecosystem contexts illustrating their ecological, continental, and latitudinal diversity

36


THE GLOBAL CLIMATE GEODESIGN BRIDGE
Geoplanner -> Geodesignhub -> AGOL bridge
Esri Geoplanner + LISD
Geodesignhub
ArcGIS Online
Carbon Assessment Tool
Create Climate Action Diagrams
Review Climate Action CPIs
Import CA Diagrams to Geodesignhub
Select Climate Actions for Designs
Negotiate Design in Geodesignhub
Export Negotiated Design to AGOL
Create Carbon Report

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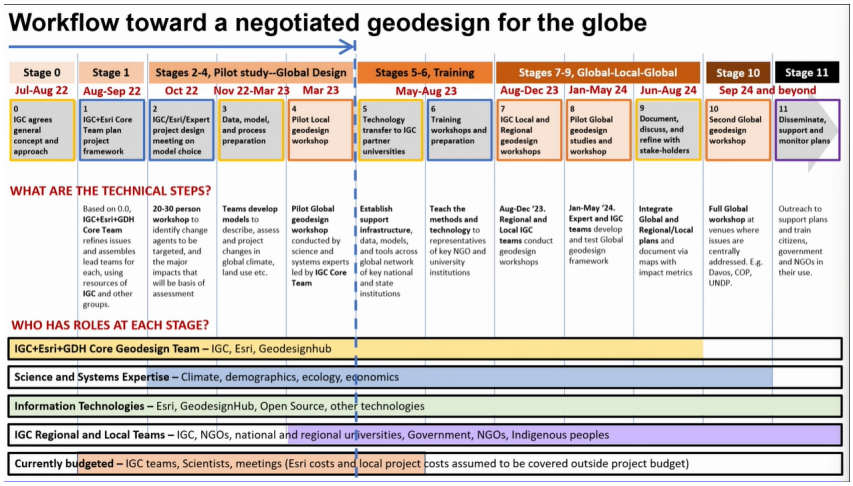
Workflow toward a negotiated geodesign for the globe
Stage 0
Jul-Aug 22
Stage 1
Aug-Sep 22
Stages 2-4, Pilot study--Global Design
Oct 22
Nov 22-Mar 23
Mar 23
Stages 5-6, Training
May-Aug 23
Stages 7-9, Global-Local-Global
Aug-Dec 23
Jan-May 24
Jun-Aug 24
Stage 10
Sep 24 and beyond
Stage 11
0 IGC agrees general concept and approach
1 IGC+Esri Core Team plan project framework
2 IGC/Esri/Expert project design meeting on model choice
3 Data, model, and process preparation
4 Pilot Local geodesign workshop
5 Technology transfer to IGC partner universities
6 Training workshops and preparation
7 IGC Local and Regional geodesign workshops
8 Pilot Global geodesign studies and workshop
9 Document, discuss, and refine with stake-holders
10 Second Global geodesign workshop
11 Disseminate, support and monitor plans
WHAT ARE THE TECHNICAL STEPS?
Based on 0.0, IGC+Esri+GDH Core Team refines issues and assembles lead teams for each, using resources of IGC and other groups.
20-30 person workshop to identify change agents to be targeted, and the major impacts that will be basis of assessment
Teams develop models to describe, assess and project changes in global climate, land use etc.
Pilot Global geodesign workshop conducted by science and systems experts led by IGC Core Team
Establish support infrastructure, data, models, and tools across global network of key national and state institutions
Teach the methods and technology to representatives of key NGO and university institutions
Aug-Dec '23. Regional and Local IGC teams conduct geodesign workshops
Jan-May '24. Expert and IGC teams develop and test Global geodesign framework
Integrate Global and Regional/Local plans and document via maps with impact metrics
Full Global workshop at venues where issues are centrally addressed. E.g. Davos, COP, UNDP.
Outreach to support plans and train citizens, government and NGOs in their use.
WHO HAS ROLES AT EACH STAGE?
IGC+Esri+GDH Core Geodesign Team – IGC, Esri, Geodesignhub
Science and Systems Expertise – Climate, demographics, ecology, economics
Information Technologies – Esri, GeodesignHub, Open Source, other technologies
IGC Regional and Local Teams – IGC, NGOs, national and regional universities, Government, NGOs, Indigenous peoples
Currently budgeted – IGC teams, Scientists, meetings (Esri costs and local project costs assumed to be covered outside project budget)

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- 異なる精度のデータの統合を前提としている点
  - 「データが揃わなければ始まらない」を徹底的に否定
- 政策によって生じさせ得る土地の状態変化を重視している点
  - マネジメントが及ぼす影響の評価
- DX
  - Alternative futuresまではdigitalization
  - 部分最適解の集合と全体最適解の関係を議論するところまで展開しつつある

Digitization
アナログ情報をデジタル化して効率化を図る

Digitalization
ビジネスモデルや仕事の仕方が大きく変わる

Digital Transformation
地域や社会のあり方が大きく変わる

Society 4.0

Society 5.0　　スマートシティ