

**Co-Creation of Knowledge** for Building Society One Step into the Future





## What is Transdisciplinary research (TDR)?



Transdisciplinary Research (TDR) is a type of research which transcends the disciplinary boundaries as well as the academic boundary to solve social issues. RISTEX has been promoting such research for the past 20 years.



Transdisciplinary Research (TDR) is a type of research which is conducted by a close collaboration between researchers and stakeholders of the social issue that needs to be resolved, and the collaborative effort is required all the way through from designing and conduct of R&D, to the social implementation of outputs.

Today we are faced with a wide variety of problems, including 'wicked problems' such as global environmental problems, which are complex, uncertain, and of which solutions are hard to define and attain.

Similarly, troublesome matters and troubled people have been emerging in aging local communities, and in the relationship between rapidly advancing science and technology (S&T) and society. These problems are intertwined with each other in a complex manner.

Thus, it is necessary for people in different disciplines and positions to bring together their knowledges and experiences to realize knowledge convergence which leads to the implementation of solutions for the future.



We believe there are potential new discoveries and innovations when existing boundaries of culture, language, values, and assumptions are transcended.

Further, TDR itself and solutions generated from TDR can be linked or applied to other related issues, research, and pursuits, which may result in more novel solutions – RISTEX promotes such a 'transdisciplinary ecosystem.'

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Who We Are

## Co-Production and Co-Utilization of Knowledge with Society: Creating Solutions for Better Society

Research Institute of Science and Technology for Society (RISTEX) is a part of Japan Science and Technology Agency (JST), that funds a wide range of R&D projects, conducts outreach activities, and proceeds own research activities, with the aim of yielding solutions to problems that humans and societies in the next generation face, such as issues related to aging society, environment and energy, safety and security, and medical and nursing care. By implementing outcomes of R&D, RISTEX aims to contribute to happiness and enrichment of people's lives.

Since its establishment, RISTEX has encouraged R&D that has a vision of its application and utilization in society. To achieve such uneasy challenges, we have been devising ways to promote R&D co-conducted with people who seek solutions to social issues.

#### RISTEX-JST

Approaches to Global Issues TDR Projects and PI's Voices

> As part of the Future Earth initiative in Japan, the "initiative for the Promotion of Future Earth Concept" (2014—2019) by RISTEX has funded various TDR projects that dealt with global environmental problems. 3 of such projects are described below.

#### File01 | 2016-2019



A transdisciplinary research by networking solutionoriented interdisciplinary sciences of environment, disaster, health, governance and human cooperation

TDR was conducted in Japan and various Asian countries, and the outputs were integrated and generalized into the 'decision science,' a methodology for social changes that improves sustainability.



66 PI says 99 YAHARA Tetsukazu (Kyushu University)

Merely putting together scientists and stakeholders doesn't make a good TDR. Where there is a conflict, researchers as outsiders can play a vital role as a 'game changer' by sweating to coordinate stakeholders and leading them to the process of problem-solving.

#### File02 | **2017-2020**

### Autonomous Innovations in Rural Communities

### Transdisciplinary Study of Natural Resource Management under Poverty Conditions Collaborating with Vulnerable Sectors

By having dialogues and deliberating with people in developing countries, who use their local wisdom to generate innovations, the project supported the sustainable management and utilization of natural resources on which the poor population is dependent. A dialogic deliberation method 'DIDLIS' (Dialogic Deliberation in Living Sphere) was developed and was used to promote co-creation of knowledge and technologies among socially vulnerable people. Then a toolbox was built by gathering various cases and was analyzed. URL: http://td-vuls.org/



#### 66 PI says 99 SATO Tetsu (Ehime University)

For a dialogue based on trust, researchers' irresponsible interventions should be avoided and rapport should be built. Choosing an appropriate field for such dialogues is equally important. As researchers, we analyzed scientifically what was happening in the field and discovered new values. Then we provided opportunities for people realizing such values to meet and exchange. The unique encounters enabled by this research are resulting in interesting outputs.

#### File03 | **2015-2017**



### Design and Reform of Social Systems Enabling Transformation to Sustainable Society

Inspired by Native Americans who made decisions from the perspective of 7 generations into the future, the method of 'Future Design' was developed which enables deliberation of social system from the standpoint of imaginary future generations. It is widely used by Japanese and overseas governments and organizations, for decision-making which leads not only to the profit of the current generation, but also for future resources and sustainability. URL: https://www.ri-futuredesign.com/schedule/

## 66 PI says 99 SAIJO Tatsuyoshi (then at Kochi University of Technology)

Our project is not a typical TDR which proceeds by closely working with local communities. Instead, the method developed has left the hands of us researchers and became widely utilized in various communities for problem-solving – as if it has become independent. I want people to know such atypical TDR exists and is equally important.



## What Global Issues Should We Challenge? Mapping the Strength of Japanese Research



RISTEX has been working on producing new evidence for strategies and policies in promoting TDR. Below is one of such efforts, a mapping of the strength of Japan in research on global issues, as a result of our survey.



## Application of the Japan Strategic Research Agenda (JSRA) An Attempt to Map Importance vs. Strength of Japanese Research

Using the Research on S&T Foresight (NISTEP Delphi Survey<sup>\*1</sup>), 346 S&T topics that appeared highly relevant to solving/improving global issues were extracted, and each topic was color-tagged to 10 Priority Research Themes of the JSRA<sup>\*2</sup>. Then, the Importance of each topic was plotted against International Competitiveness, which resulted in several clusters of topics with the same color.

\*1 NISTEP (2019) "The 11th S&T Foresight (Delphi Survey)"

\*2 From a project "Research and Study on Selection of Globally Prioritized Themes for Japan to Be Engaged in and on R&D Designs for Such Themes" (2014-2017, PI: TANIGUCHI Makoto, Research Institute for Humanity and Nature)



Sustainable production/processing/distribution/consumption of food

Prediction / impact / adaptation / mitigation of global warming

- Development/assessment/management/innovation of sustainable energy and resources
- Sustainable local communities
   Urban-rural interdependence
   Realization of socioeconomic development and environment conservation
- Realization of socioeconomic development and environment conservation
   Environment and culture/lifestyle/values
   Literacy/dialogue/decision-making
- Avg. competitiveness
   Avg. importance

### Important and Internationally Competitive Urban-rural interdependence

e.g., forecasting of localized downpour, restoration of riverbank deformation, water purification/rainwater management

#### Average Importance and International Competitiveness

### Sustainable production/processing/ distribution/consumption of food

Not necessarily a strength of Japan, implying the necessity to consider collaborative research with other countries

Not Internationally Competitive and Importance Varies

### Realization of socioeconomic development and environment conservation

There is a potential for good international collaboration and/or co-creation with local stakeholders

## Promoting TDR by Application of Project Outputs and Own Surveys

## To Enhance the Roles of Funding Agencies

RISTEX promotes TDR not only by funding, but also by attempting to apply project outputs as well as by conducting own surveys. The graph shown here is a result of an experimental analysis for the consideration of future TDR promotion strategies. It was radical in its use of the JSRA, the output of a project funded by RISTEX's Future Earth Initiative. The map is yet inadequate for it lacks the appropriate inclusion of SSH (social sciences and humanities) topics, for example, but RISTEX continues to attempt to visualize the strengths of Japanese TDR, and to enhance the roles of JST as a funding agency.

#### RISTEX-JST

To Solve Social Issues
Keys to Successful TDR

What factors are important in conducting international TDR that addresses global issues, and how can Japan's strengths be incorporated?

In a survey conducted in 2021, we reviewed discussions about evaluation of SSH (social sciences and humanities), and interviewed researchers who received funding by the Belmont Forum,\* associated with the Future Earth.

\* An international partnership that mobilizes funding of environmental change research. JST is its member. By issuing international calls for proposals, Belmont Forum aims to accelerate the delivery of research to remove critical barriers to sustainability.

Network of Researchers

To prepare a TDR proposal incorporating various disciplines and standpoints in a short period, it helps to possess an international network of trustworthy researchers. Being interested in collaborating with other disciplines, or in TDR itself is essential, as well as a willingness to take on new challenges. Stakeholders are diverse, and thus building appropriate relationships accordant with each stakeholder in each situation is important. In TDR, 'with whom' is essential, and in particular, those who know about the community may possess valuable information, perspectives and/or ideas.

Networking with Stakeholders

Contribution of SSH researchers is essential in TDR which aims for social implementation of outputs. SSH researchers are increasingly more visible in recent research frameworks and activities. It is desirable if they acquire some understanding of natural sciences while establishing a position which ensures optimal contributions by different disciplines.

**Roles of SSH** 

#### **Research Management**

It is essential to listen to each other on the equal basis from the initial stage of building a research team. Research visions should be coordinated among project members given that there could be differences in expectations and enthusiasm towards the project, and that the same words could be used for different meanings. Communication methods should be devised so that members are interested in each other's viewpoints and constructive discussions are encouraged.

**Efforts Towards Social Implementation** 

The PI should be a good team leader as well as committed to building a good relationship with society. Immense efforts and ideas are required to fulfill the goal of TDR which is the social implementation of the outputs. TDR is important not only for existing problems but also for potential problems which cannot be resolved immediately but need to be addressed.

## Outputs and Outcomes of TDR? A Long-Term Perspective on TDR

How should TDR be evaluated so its values can be visualized better?

The diagram shows the perspective on outputs/ outcomes of SSH by SCJ\*3 and the 'productive interactions'\*4 by EU put together. It illustrates that outputs/outcomes have academic and social impacts which affect each other, and that the networks generated in a project can also be regarded as an output. Interviews conducted to researchers who received funding by the Belmont Forum also indicated that it is important for funders to understand that the research continues after the project is over often with different sources of budget, and thus not to narrowly define TDR when evaluating the project. By grasping the long-term and wide-spread development of TDR, we have started to visualize values and outputs/outcomes of TDR difficult to capture with the current evaluation framework.

- \*3 Science Council of Japan (2021) Toward Research Evaluation for the Advancement of Science: Challenges and Prospects for Desirable Research Evaluation.
- \*4 For example, SHINEHA Ryuma (2020) Responsible Governance of Science and Technology. Nakanishiya Press.



## Policy Implications To Promote TDR One Step Further

Following are some policy implications for promoting TDR that addresses global issues, based on the voices of TD researchers.

### A Mechanism to Assist Co-Creation with Stakeholders ( 2013)

Co-creation with stakeholders is the essential part of TDR, but many researchers find it difficult. A mechanism to assist researchers in dialogues with stakeholders and in setting a new research topic based on the dialogue, with a consideration of budgeting and sharing of know-how, would be helpful.

### Follow-Up Surveys of TDR

For generalization of TDR related knowledge, accumulation of knowledges and experiences by following up completed projects is important. To encourage evidencebased actions, project data should be preserved and made openly available. When setting up such a system, one of the characteristics of TDR, that generation of outputs often takes time, should be taken into account.

#### Generalization of TDR Related Knowledge



There are experts in disciplines that are related to social issues addressed in TDR but those who specialize in methodology of TDR and/or have experiences of TDR are yet few. Thus, learning from experiences in similar funding agencies, gathering information about TDR conducted, and making such information openly available are important.

#### Visualization of Continuity

Although research is normally evaluated within each funding scheme, as shown in the diagram in P4, TDR of global issues tends to continue after a project is over, with different funds. Visualizing the connections between various projects related to one TDR by a phylogenetic tree may lead to more appropriate evaluation of TDR.

## Research Evaluation from Various Perspectives

TDR outputs can vary tremendously as seen in P4. If research evaluation can take into account various factors such as researcher's experiences/maturity, networks formed, media/web coverage, patents and other intellectual property, and changes in local institutions/awareness, it can motivate researchers whilst rendering funders to grasp the project's achievements better.

### Strategies to Leverage Japan's Strengths

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Creating a scenario of research development centered around Japan's strength may open up more opportunities for TDR led by Japanese researchers. It is worth identifying natural science topics in which Japan already has strengths, such as cryosphere, and formulating a strategy of possible collaboration with other disciplines and linking these to relevant social issues. As Japan has a characteristic natural environment and has relatively abundant resources, it is likely to be referred to by other Asian regions. Utilizing such advantages to increase the nation's presence in international collaboration research is important.

#### Training TD Researchers

The training of TD researchers can take various forms, rather than being confined to a specific framework. It may be harder to produce academic papers from a TDR project, but valuable insights and findings could be gained by participating in TDR. There should be more young researchers willing to engage in TDR as they find their research beneficial to society. Meanwhile, academia should value their challenges appropriately.

#### Supporting Participation in International Collaborative Research

First and foremost, more Japanese researchers should participate in international collaborative research. To gain unexpected information and opportunities, they need to be in the international community. And there can be a chance for them to be involved in designing a new international system/ institution. A higher visibility of Japanese researchers in international TDR would open up more opportunities for TDR in Japan.

## Reference





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## What Is Transdisciplinary Research (TDR) !?

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