

THE UNIVERSITY FOR SUSTAINABILITY

SUSTAINABLE DEVELOPMENT RESEARCH NETWORK

A State-of-the-Art Global Knowledge Platform





SUSTAINABLE DEVELOPMENT RESEARCH NETWORK

Accelerating scientific research, development and innovation for a just and humanitarian transformation to sustainable development; the Sustainable Development Research Network (SDRNet) is a planet-centric approach to synergizing the experience and reach of thousands of scientists and innovators worldwide to turn knowledge into action.

In the COVID-19 crisis, we have all seen how crucial it is to have at hand smart researchers, clever innovators and entrepreneurial organisations with disruptive ideas and technologies that could pivot quickly into vaccine, treatment, healthcare application or other solutions. With SDRNet the University for Sustainability is making this effort permanent. We are creating a dynamic ecosystem of innovators and researchers who could respond quickly to calls for new ideas and solutions in an emergency - whether for wildfires, earthquakes, pandemics or other disasters.

The Problématique

Global society is also in the throes of a revolution that is transforming the way in which information and knowledge are acquired, stored, communicated and used. This is revolutionising the way we do science and shall better enable us to address the grand challenges of our times. Born digital, the University for Sustainability has an obligation to positively contribute to this transformation and its outputs to a range of societal actors, including citizens, to address shared problems and enable the co-creation of actionable knowledge.

In this connection we use the term "Science 2.0" to describe a revolution in ways of doing and organising scientific research. Science 2.0 is enabled by digital technologies, driven by globalisation and growth of the scientific community as well as the urgent need to address the grand challenges. The changes impact the modus operandi of the research, development and innovation cycle as well as the way the cycle is organised. The old distinctions between basic and applied science, and between science and technology, are neither fit for purpose nor fit for the future.

Many of the significant problems faced by science and society are inherently complex. They concern the dynamic of systems that exhibit emergent properties including among others climate change and of pathways to sustainability. Researching these challenges almost invariably requires interdisciplinary collaboration. In this regard, the tools of Science 2.0, enhanced by the techniques of artificial intelligence, have created

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unprecedented opportunities to exploit such collaboration by integrating relevant data from disparate disciplinary sources. Yet our ability to combine data from heterogeneous sources and across disciplines remains limited. More problematic, the vast majority of scientific data collected is never used. This is exacerbated by the uneven adoption of new data-intensive techniques across scientific communities and practices.

Addressing these problems is crucial if we are to use to best effect the increasing quantities of diverse data to understand the complex adaptive systems that are at the heart of global challenges. Success will depend on active participation and engagement from all disciplines, including the social and human sciences, and by scientists from all parts of the world, including regions where data science capacities are limited.

Ushering in an era of Science 2.0; leveraging open science and open innovation; SDRNet is a state-of-the-art global knowledge platform unlocking unused scientific data, accelerating the development, diffusion and absorption of breakthrough research and innovative solutions that catalyse transformation at scale and at speed.

From siloed experimentation to network-enabled collaboration, we are shifting the paradigm for how the research community, government and business engage with each other in accelerating toward sustainable development.

Powered end-to-end by socially responsible Artificial Intelligence to make today's scientific research more efficient, and tomorrow's revolutionary, a network-wide research cloud shall offer high performance research computing as a service to provide new ways of doing science, harness permitted data, responsible artificial intelligence for sustainable development, and enable world-class cross-disciplinary research collaboration and game-changing innovation.

Ushering in an era of Science 2.0; leveraging open science and open innovation





The Challenges and Opportunities

Despite the momentum gained since the signing of the Paris Agreement and the 2030 Agenda for Sustainable Development, the potential of the centres of research excellence, development and innovation to contribute towards sustainable development has not been fully optimized. Knowledge gaps, isolated and fragmented knowledge bases, uneven access to and diffusion of SDG solutions, expertise and resources are major obstacles. There is a need to develop systematic multi-stakeholder collaboration and multi-disciplinary knowledge sharing and brokering to accelerate SDG solutions. By offering new and more efficient tools, digital transformation can increase connectedness among research centres, enhance the sharing of knowledge, optimize scientific data's usability and innovations and entrepreneurship opportunities to accelerate sustainable development.

“ ... multi-stakeholder collaboration and multi-disciplinary knowledge sharing and brokering to accelerate SDG solutions.

There is growing consensus around the effectiveness of Artificial Intelligence-enhanced knowledge and innovation platforms and the development of scalable solutions to address transnational SDG challenges.

The SDRNet Solution

To respond systematically and effectively in supporting researchers and member organisations need to connect, learn and collaborate, the University for Sustainability developed SDRNet – a global knowledge and brokering platform. It shall partner with VISTA -- the Innovation and Investor Network to accelerate investing in our future.

Powered by Artificial Intelligence, SDRNet is a vertical social network that connects and links centres of research excellence and independent researchers making it easier for SDRNet members to access, navigate and use a broad range of knowledge, good practices on Sustainable Development (SD), research, experts and members. It serves as an integrated solutions platform for SDRNet members in the University for Sustainability ecosystem.





SDRNet's planet-centric mission is to accelerate discovery, development and adoption of sustainable development solutions and humanitarian action. By empowering the voices of the Global South, we can better understand the concepts, methodologies, policy implications and solutions to enable governments and practitioners to realize the full potential of South-South and South-North cooperation towards a sustainable future for all.

With a scalable digital platform, SDRNet bridges the gap between isolated and fragmented information systems and knowledge bases that hinders: researchers and development practitioners from making new discoveries, the diffusion of knowledge, and the absorption of breakthrough research and innovative solutions.

“ ... accelerate the diffusion of frontier sustainable development solutions.

Among the features that makes SDRNet unique is the integration of AI algorithms to enable the discovery of new relationships and patterns hidden in semantically-enriched knowledge bases and match solution providers with needs. The platform automatically creates ever-more relevant recommendations and matchmaking suggestions for researchers, policy analysts and practitioners by using machine learning to provide the most relevant content, data, and good practices to enhance research productivity, knowledge sharing, and accelerate the diffusion of frontier sustainable development solutions. (*)

For researchers, SDRNet is a revolutionary digital knowledge platform:

- Enabling you to create your research profile, share your research and data at any stage of your research cycle;
- Expand your sphere of influence to impact the global debate with frontier thinking and receive global recognition;
- Empowering you to upload and make your research not just visible but discoverable, read, and discuss publications, follow a research interest, access publications for free, and join discussion groups with other scientists and experts. As permitted, your profile may be used to suggest funding opportunities, to build connections to funders and industry members to accelerate the absorption of frontier sustainable development solutions;

* For an elaboration see the attached technical appendix.





- Connects South-South and South-North Science, Technology and Innovation as well as traditional and indigenous knowledge. For no source of wisdom can be left out, just as no one can be left behind!
- Provides advisory services by linking SDRNet members with thematic experts and development partners to provide real-time networking support;
- Promotes the sharing of knowledge and best practices in harnessing STI that creates practical solutions to sustainable development with and in the Global South with our robust global community of practice;
- Offers technical guidance and analytic tools to inform policy approaches for promoting STI for sustainable development;
- Advances relations between scientific institutions and organizations in the Global South and their counterparts in the North through the development of communities of practice and cooperative programmes; and,
- Furthers member institutes' contribution to, and involvement in shaping and investing in the future of science, technology and innovation for sustainable development.

“ ... harnessing STI that creates practical solutions to sustainable development with and in the Global South

SDRNet's Research Cloud Computing facility provides a smart solution for analysing knowledge bases to:

- Easily discover relevant information across huge volumes of siloed structured and unstructured data-sources;
- Access semantically interlinked data to extract powerful and actionable insights;
- Enable the discovery of new relationships, detect patterns and infer new facts hidden in semantically enriched knowledge bases; and,
- Accelerate the development of risk-mitigated scalable SD solutions.



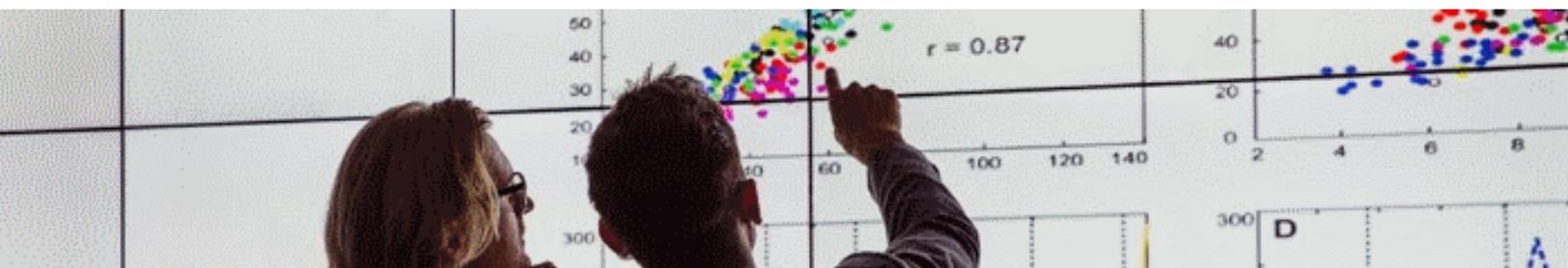


Whom does it Serve?

The SDRNet knowledge platform serves:

- Public and private entities, decision makers, and practitioners working towards the implementation of the sustainable development agenda;
- Global technology users, advisors and practitioners involved in international processes related to STI;
- The University for Sustainability ecosystem technology focal points and their associated stakeholders; and,
- Entrepreneurs, academics, researchers, development organizations, and investor groups involved in capacity development to improve sustainable development solutions diffusion and absorption.

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Technical Appendix

Among sustainable development research communities, policy analysts and practitioners there are profound information asymmetries and siloed knowledge that inhibits the development, diffusion and absorption of scalable sustainable development solutions. At the same time, as more and more knowledge populates our digital ecosystem, it becomes increasingly difficult to process content and retrieve appropriate information. SDRNet will add new value to vast stores of unused data. Indeed, every 18 months we double the amount of data we produce, 85 per cent of which is never used. The challenge is not only to utilize but to optimize scientific data's usability and enable better discoverability of information, leveraging its hidden treasures and untapped opportunities to accelerate the transition to sustainability.

Our aim is to bridge the gap between isolated and fragmented information systems

SDRNet deploys a knowledge base using graph theory, Big Data and Artificial Intelligence (AI) to optimize scientific data for greater discoverability and usability. It is specifically designed and optimized for highly interconnected data sets to identify patterns and undisclosed contexts and knowledge. Our aim is to bridge the gap between isolated and fragmented information systems that hinder researchers from making breakthrough discoveries, enhance the development of science-based policy, accelerate innovation and responsibly harness the exponential technologies of the Fourth Industrial Revolution for sustainable development.

The SDRNet knowledge base helps sustainable development researchers and analysts uncover new ideas and findings, and apply them in their thinking and collaborations to drive breakthrough discoveries and frontier innovations.

The knowledge base creates a domain of structured and unstructured data that aligns with how researchers and analysts cognitively organize information. Distinct from conventional data bases, the SDRNet knowledge base adds a concept-aware or semantic model to data sets. This includes a formal classification system with classes, sub-classes, relationships, instances (the occurrence of a class or object), and ontologies, but also transparent rules for interpreting data.





In this domain, text analysis is used to create structured data out of unstructured and often highly disparate content. Text analysis involves the parsing of texts, for example, conducting morphological, grammatical and syntactical analysis in order to infer relationships and extract knowledge from exabyte scale data sets.

Seamlessly integrating siloed data and fragmented knowledge, the SDRNet algorithms search for pathways, clusters, similarities and contextualization to synthesize semantically enriched meta-data from documents, organizations, institutions, funders, research grants, patents, clinical trials, substances, conference series, events, citations and reference networks and links to research data sets. The semantically enriched data provides a description of how information is related and can graphically represent the sustainable development research domain in new ways.

“ ... a smart solution that analyses the research literature and data to facilitate the identification of breakthrough knowledge

In this manner, the SDRNet knowledge base offers a smart solution that analyses the research literature and data to facilitate the identification of breakthrough knowledge by:

- Automatically categorizing and semantically parsing diverse, dynamic and complex documents and interconnected, contextualized data sets to reveal undiscovered relationships;
- Using machine learning algorithms that bring structure and meaning to information, the results of the text analysis are semantic annotations that describe relationships and patterns between data in various formats and sources. The annotations represent structured meta-data. This creates context and forges links in the data sets to specific concepts which can be represented as a knowledge graph – an intuitive and dynamic visualization that is the basis for natural language processing and AI-driven solutions. A visualization tool allows you to explore the graph in a variety of ways, such as filtering nodes and relationships etc. to show different views of the data from the graph.



Knowledge graphs are dynamically inter-linked clusters of data that describe real-world entities or things and their emergent properties. They may be used as referential models to identify sustainable development concepts and relationships in the tsunami of unstructured content coming from scientific publications and diverse data sets. The extracted data is fed back to the knowledge graph to further enrich the data sets with highly contextual and personalized results. It integrates structured and unstructured data describing entities and specific concepts in a target domain as well as the relationships among them. And whereas conventional data technologies highlight the structure of the data, semantic technology and knowledge graphs convey the provenance of the data and meaning in a form understandable to researchers and policy analysts.

Accelerating the quest for meaningful information by revealing the interconnected complexities latent in your data sets and breakthrough knowledge discover

Accelerating the quest for meaningful information by revealing the interconnected complexities latent in your data sets and breakthrough knowledge discovery, semantic technology is:

- Context-aware - identifying objects pertaining to your research and retrieving all relevant high-value results that references these objects in the specified context based on their properties.
- Distinct from lexical analytics, it returns results increasingly aligned with your interests and preferences informed by your utilization of the SDRNet knowledge platform, research profile, publications, and activities as well as search history.
- It is extensively interlinked. It recognizes multiple references to the same entity and can provide additional information related to your query such as news feeds, images, social media, etc. enabled by high speed and bulk ingestion of open and commercial public data sets as well as proprietary data sets.

Together with an extendable classification of the data, there is also a formal inference layer built on top of the SDRNet knowledge base. This is a series of transparent rules and statistical models for interpreting data and information and how to use the data.





While data centres have relied on large, centralised data stores, the SDRNet team believes that model will become less relevant as 5G networks become the new standard in telecommunications and start to power the Scientific Internet of Things applications. That way, most scientific computing will move to connected devices at the edge of networks, away from the large computing facilities of today.

Distinct from a data base with a flat structure and static content, the SDRNet knowledge base advances discovery and innovation by offering robust and insightful research, supporting the development of sustainable development knowledge, making ideas and information accessible and discoverable by:

“ ... we are on the cusp of systemic changes in the way the science and research system functions

- Providing seamless data exploration, semantic technology and knowledge graphs leverage AI-assisted knowledge exploration capabilities to provide a much more complete understanding of the sustainable development knowledge domain. This enables researchers to: gain faster and more cost-effective access to meaningful and accurate data, analyse that data and gain scientific and policy insights. It also allows researchers to define algorithms which, when applied on data at scale, can infer new facts and apply predictive models to facilitate actionable data-driven policy design and decision-making;
- Driving breakthrough knowledge using machine learning predictive algorithms to suggest concepts from the knowledge graph to uncover novel patterns and correlations between and among sustainable development concepts. Moreover, facilitated by a dynamically enriched knowledge graph they can autonomously propose and test frontier hypotheses.

This is a radical break from the model of scientific inquiry that emerged during the European Renaissance. Indeed, we are on the cusp of systemic changes in the way the science and research system functions. It is Science 2.0, characterised by: an open, collaborative networked way of doing research, data-intensive, digitally connected across borders and disciplines. It is causing an explosive increase of scientific production and innovation.



Leveraging Science 2.0, SDRNet offers a planet-centric state-of-the-art knowledge base and platform to accelerate sustainable development research and policy analysis to drive solutions. In offering the SDRNet knowledge base we increase content discoverability and provide data tools and services for researchers, authors, editors, data scientists, funders, investors, policy analysts, practitioners and many others by adding value across all content types.

SDRNet offers a planet-centric state-of-the-art knowledge base and platform to accelerate sustainable development

The impact of AI-driven semantic technologies and knowledge graphs on the way we conduct research, discovery and innovation is revolutionary. Its implications range from discovering non-obvious relationships among facts through predictive analytics, to conversations with cognitive systems.

Eroding information asymmetries, siloed knowledge and unused scientific data, the SDRNet knowledge base takes us further on our quest for meaningful information, knowledge discovery and innovation.

The SDRNet promises to bridge the gap between isolated and fragmented information systems that hinder researchers from making breakthrough discoveries, accelerating responsible innovation and harnessing frontier technologies for sustainable development.

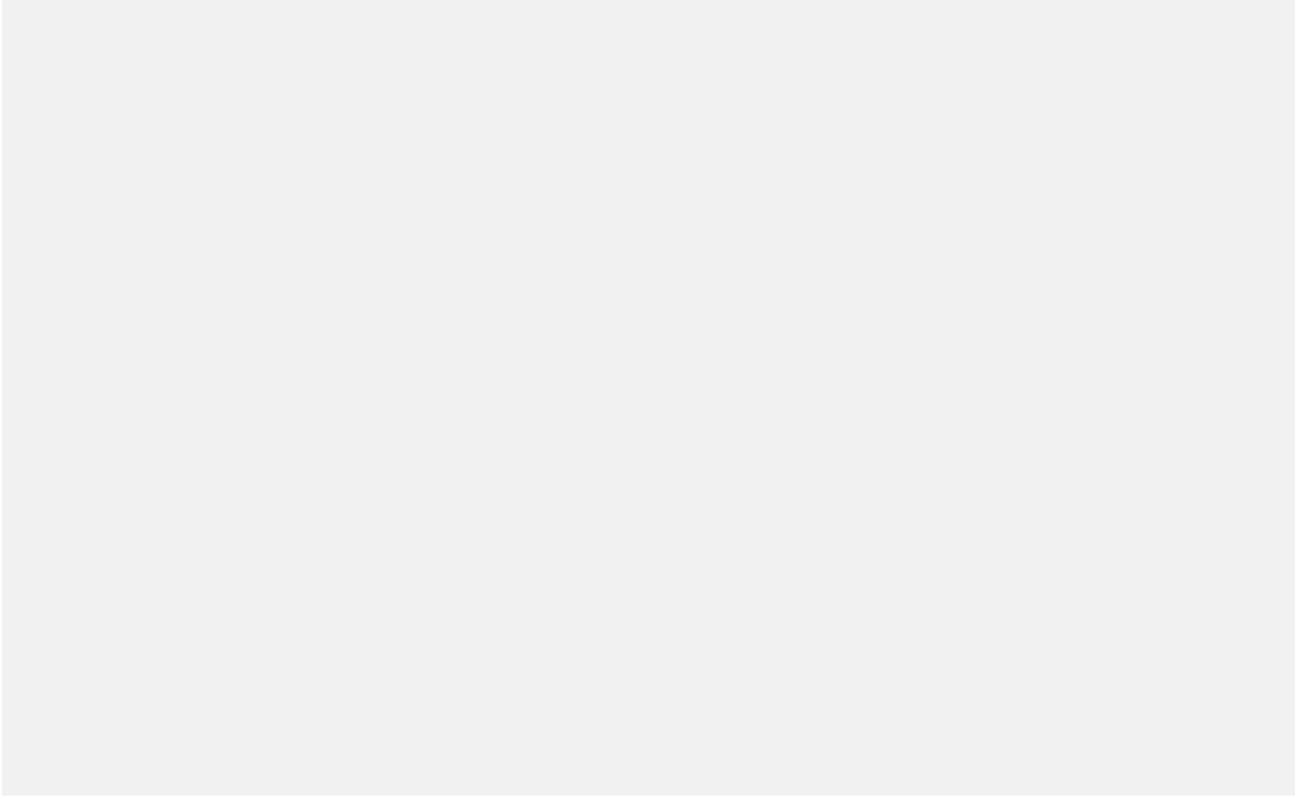
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To learn more about the Sustainable Development Research Network visit the SDRNet webpage at www.u4sustainability.org/SDRNet





Notes



"All human beings are born free and equal in dignity and rights." These simple but powerful words are the first line of the Universal Declaration of Human Rights adopted by the United Nations in 1949. The declaration's power has always depended on our collective will to uphold its noble aspirations. The University for Sustainability does not discriminate on the basis of race, colour, creed, national origin, gender, sexual orientation, age, or disability in any of its policies, procedures, or practices.



Secretariat

The University for Sustainability
150 Washington Ave, Suite 201
Santa Fe, New Mexico, U.S.A.

Tel: +1 505.428.9599

Website: www.u4sustainability.org

Email: contact@u4sustainability.org