

Focusing on key sustainable development goals would boost progress across all, analysis finds

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By using a mathematical network analysis to map the relationships identified by an International Council for Science report, the University of Bath research reveals that direct efforts focussed on a critical few: Life below Water, Life on Land, and Gender Equality, would reinforce the virtuous circles buried in the network and hence lead to greater overall progress.

The UN Sustainable Development Goals (SDGs) were agreed in 2015 as a blueprint for a sustainable world to be achieved by the year 2030. The seventeen goals cover economic, societal and environmental issues including ending poverty and hunger, providing quality education, reducing inequalities, conserving marine ecosystems and acting on climate change, and between them contain 169 separate targets.

Professor Jonathan Dawes from the Centre for Networks and Collective Behaviour and the Department of Mathematical Sciences, University of Bath, set out to analyse the direction of influences between all the goals using a systems perspective—the first time this has been done.

His analysis draws on an influential report from the International Council for Science (ICSU, now the International Science Council—ISC) and reveals that if resources were unequally allocated, and goals that were further 'upstream' in the system were prioritised, then this prioritisation would generate many more positive impacts. It

would also mitigate the trade-offs that would otherwise mean achieving some goals only at the expense of others. The clearest senses of direction in these effects are between goals 4-16 and goals 1-3 (no poverty, zero hunger, and good health and wellbeing).

Progress on almost every one of the broader societal and environmental objectives encapsulated within goals 4-16 will have significant positive impacts on goals 1-3. For example the ICSU Report notes that achieving gender equality (goal 5) is fundamental to poverty eradication (goal 1), will result in increased engagement in food security and initiatives to improve nutrition (goal 2), and will cause greater attention to be given to the need for access to healthcare (goal 3). In these ways, progress on goal 5 will, in itself, have significant positive impacts on progress towards goals 1-3; but the impacts the other way around are far smaller; it is possible to meet goals 1-3 without achieving gender equality. This pattern is repeated in many other cases: in order to achieve every goal, it then follows that more attention should be directly focused on goals 4-16 rather than goals 1-3.

The study is published in the journal *Sustainable Development*.

Professor Dawes, who is also Director of the Institute for Mathematical Innovation at the University of Bath, said: "Prioritisation is both politically and operationally challenging, but by focusing efforts on a few key areas we could sharpen up the SDG messages to ensure that this incredibly broad global agenda results in clearer global action.

"This analysis, using a very simple mathematical model, takes a systems level look at all the linkages between the goals and what we see is a directionality—or a domino effect—in that progress in some areas leads to more progress in others.

"Some goals are better reinforced by others in virtuous circles, but others

aren't: we need to prioritise and support the goals that aren't in order to make sure that the system as a whole is successful."

Prof Dawes would like to see the wider academic community, particularly in applied mathematics and economics, contribute more to the challenge of understanding the linkages between the SDGs, including understanding variations from country to country and over time.

He said: "Almost all academic research focusses on issues related to one or only a handful of SDGs and targets. In contrast, this research is intended to be complementary—looking at the system-level linkages between goals, and their implications. It's definitely not the last word on the topic: these are complex problems, and there's a great opportunity for the academic community to become more involved in these systemic issues.

"Modelling also allows us to make predictions as to which goals are most likely to be achieved by 2030 under 'business as usual' scenarios, and then to propose alternatives. We're privileged as academic researchers to be able to discuss courses of action that politicians would find very difficult to introduce into the public debate.

"Perhaps we can follow the example of climate modellers, where different computer models make predictions that vary in detail, but when taken together provide consistent estimates of future trends. Multiple research clusters examining the SDGs and their linkages from different viewpoints might allow us to pick out common factors—and a systems level approach gives us the ability to pull out clear priorities from a complicated, difficult picture. "

On September 24-25 world leaders will meet at the UN for the first Sustainable Development Goals Summit since the adoption of the 2030 Agenda, to discuss the 2019 Global Sustainable Development Report,

and highlight SDG 'acceleration actions', as part of the Action for People and Planet week within the 74th Session of the UN General Assembly.

Provided by University of Bath

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