The recently cancelled Swansea tidal lagoon had the potential to drive innovation in far more sectors of the UK’s economy than just construction and power generation.

The UK Government recently cancelled the planned Swansea tidal lagoon project. The £1.3 billion energy development would have seen the construction of a first-of-its-kind artificial lagoon, capable of harvesting electricity from the natural rise and fall of the tides.

A 2016 report by former energy minister Charles Hendry concluded tidal lagoons could play “a cost-effective role in the UK’s energy mix”, and the Swansea project would provide a much needed boost to the Welsh economy. Despite this, policymakers were concerned the lagoon would not provide a sufficient return on investment to make it worthwhile. But beyond the project’s obvious financial returns, its construction would have had the potential to create knowledge spillovers that could have driven innovation across the UK’s entire economy.

By their very nature, innovative projects lead to the development of new designs, tools and thinking, which can then go on to drive innovation in disparate fields. The solutions to problems that might have arisen during the Swansea tidal lagoon’s construction and operation could have inspired people in different industries, encouraging broader economic activity, which in turn would have contributed to higher economic growth.

Clean patents receive 43 per cent more citations than their dirty counterparts

Major scientific and engineering endeavours have a history of prompting innovation in seemingly disconnected industries. For the Apollo missions, NASA contracted Black & Decker to design a small, wireless drill that could extract core samples from the Moon. The company developed a computer programme to optimise the design and energy consumption of its motors to fit NASA’s specifications, and later used the same techniques to develop the portable handheld vacuum known as the Dustbuster. Single-crystal silicon solar cells, memory foam and “space blankets” are just a few more inventions that can be traced back to NASA in some way. The connection is not always obvious, but space exploration has improved our lives in many ways.

Knowledge spillovers

My research has looked at ways to measure knowledge spillover across industries and understand its reach, which is done by examining patent databases from all over the world to track citations. By doing this, it’s possible to see what inventions went on to inspire new innovations in different fields, and what those inventions then went on to inspire themselves.

Marine energy projects have already gone on to excite inventors in completely separate industries. A good example is a US patent filed in 1981 that details a system to turn wave motion into electrical energy. Many years later, the patent was cited as an inspiration for an audio encoding technique, with the mathematics used to understand ocean waves also applicable to sound waves.

By their very nature, innovative projects lead to the development of new designs, tools and thinking

Providing support to construct tidal and other marine power plants would have likely lead to further innovations in this area, which could then have lead to similar spillover effects. According to research I published in 2014 with my colleagues Antoine Dechezleprêtre from the London School of Economics and Myra Mohnen from the University of Essex, clean patents receive 43 per cent more citations than their dirty counterparts. The gap is even larger when limited to the electricity production sector, with clean patents receiving 49 per cent more citations than patents on technology related to internal combustion engines and coal power plants. Interestingly, the gap between clean and dirty technologies has been constantly increasing over the past 50 years.

Keeping it domestic

While knowledge spillovers are desirable, they create what economists call a market failure: the private companies providing the research and development for the original innovation will not benefit from the spillovers. Hence, private companies will invest a lower amount in such R&D activities than would be socially optimal. This provides a strong case for a government to step in and provide support; in particular to areas that generate more spillovers than others. However, from a national point of view, governments also need to take into account if spillovers will primarily benefit
other domestic companies or inventors further afield.

We have developed a new methodology to do this while also taking into account indirect spillovers by building on methodology developed by Google to rank websites. For example, a UK innovation might initially lead to spillover benefits to an inventor in the US, who then inspires further innovation in Brazil followed by innovation in India. Only after several innovation steps might some spillover benefit arrive back to another innovator in the UK.

Marine energy technologies such as the Swansea tidal lagoon generate on average the second highest amount of knowledge spillover in the UK.

Based on this new methodology, we find that marine energy technologies such as the Swansea tidal lagoon generate on average the second highest amount of knowledge spillover in the UK; only efficient aviation technologies generate more on average. We are planning to publish more detailed findings on this later in the year.

The evidence so far indicates the Swansea tidal lagoon project had the potential to benefit the UK’s economy in Wales and beyond – exactly the kind of project a government looking to stimulate broader economic activity should invest in.

Sir Issac Newton famously quipped: “If I have seen further, it is by standing on the shoulders of giants.” Based on our research, we might conclude every country has different giants – and in the UK some of those giants are power plants in the Bristol Channel.