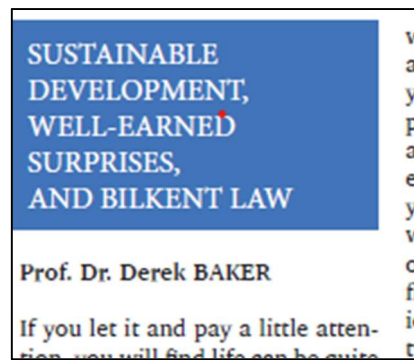


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SUSTAINABLE DEVELOPMENT, WELL-EARNED SURPRISES, AND BILKENT LAW

Prof. Dr. Derek BAKER

If you let it and pay a little attention, you will find life can be quite surprising. Until I was 21 I never had a desire to travel, much less live, outside the US. At 32 I was shocked to find myself not only with a PhD but also with a tenure-track academic position. At 45 I couldn't believe I was being paid to live and work on a Mediterranean island. At 50 I wrote the European Union Horizon 2020 SolarTwins proposal that was the only accepted Twinning proposal out of 23 from Turkey. In February 2020, I wrongly believed that pandemics only occurred in history books. When I woke up on 23 November 2020, I never imagined that by the end of the day I would be invited to submit an article on Sustainability to *Sine Qua Non*.

What's the difference between a crazy man and a tenured male Professor? Both are prone to pontificate on subjects that they know little about, including sustainability. However, while the crazy man can't keep a job, the tenured Professor can't be fired from his job.

Sustainability. Sustainable. Sustain. Take a moment and imagine a truly "sustainable" world. What are the most important characteristics that differentiate this sustainable world from our current world? Did you imagine a utopian world where there are no problems and nothing changes? If yes, is there room in your sustainable world for hopes, dreams, creativity, hard work, risks, successes, failures, and everything else that, while perhaps not always fun, makes the future, and therefore life, so interesting? Would you

want to live in such a "sustainable" world? Or would you find your life boring and lacking purpose? Or perhaps you imagined a sustainable world as being "at equilibrium," or "in balance." If yes, how does your sustainable world respond to events outside our control such as earthquakes, floods, droughts, and pandemics? In engineering we define two types of equilibrium: static and dynamic. Static equilibrium is a state where the system and the point of equilibrium do not change with time. Importantly, static equilibrium is not possible for natural ecosystems that, by definition, evolve with time. Rather, "sustainable" ecosystems are characterized by an evolving dynamic equilibrium where at any point in time the system is not truly at equilibrium, but rather is trying to evolve toward equilibrium. Pulling these ideas together, I think our idea of a "sustainable" world is a human construct with a singular goal to achieve a dynamic equilibrium that "sustains" the human race, and "saving the world" is only important to the extent that it "saves the human race." As a human construct, our image of a sustainable world reflects what we know and what we value, and this image will necessarily evolve with time as our understanding of sustainability becomes more nuanced and sophisticated.

Sustainable Development: In 1987 the United Nation published the seminal book *Report of the World Commission on Environment and Development: Our Common Future*, which for brevity is often referred to as *Our Common Future* or *The Brundtland Report*. *Our Common Future* is probably best known for defining sustainable development as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs." For me the decision

to define Sustainable Development rather than Sustainability is consistent with seeking dynamic equilibrium for an ecosystem that is evolving not only in response to unpredictable natural events, but also due to human activities resulting from our innate desire to procreate, to solve problems to make our lives better, to create to make our lives richer, and to test, learn and explore to satisfy our curiosity. Or more fully, this definition suggests that we should not seek sustainability as a final destination. Rather we should seek sustainable development as the never-ending extension of an increasingly sophisticated and high bridge. And while this bridge always points towards an uncertain and increasingly complex future, the bridge is not straight but rather bends in response to our evolving ecosystem. At some point in the future this bridge will fail, perhaps due to forces outside our control (e.g. asteroid) or perhaps due to human activities (e.g. climate change), and society will collapse. Thus, sustainable development is nothing more than each generation postponing this failure for at least one and ideally several more generations. Another important idea for me from *Our Common Future's* is that sustainable development is based on inter-generational equity rather than inter-generational equality. That is, sustainable development occurs when the present generation bequeaths to the next generation the opportunity for a quality of life that, while perhaps different, is at least as good if not better from theirs. For example, sustainable development suggests that it would be okay for one generation to consume a disproportionate share of oil on the condition that any resulting environmental problems are manageable, and they leave new energy technologies that are at least as good and preferably better than oil (e.g. affordable and reliable technologies based on solar and

wind). Focusing specifically on sustainable energy technologies, I think all energy technologies, including those based on renewable energy sources, will always involve risks, trade-offs, and create problems, including environmental, and therefore the “best” energy technology for today is the “least bad” option, and at best this “least bad” option is a temporary solution until the next generation can develop something better.

Sustainable development requires well-earned surprises. In November 2018 I was invited to the conference CSP4Climate to present Turkey’s Approach to Decarbonising the Energy Sector and participate in the panel discussion Energy Options and Climate Change. The conference included many globally leading climate change experts who presented results from sophisticated analyses that predicted a gloom and doom climate future based on historical climate and technology trends. During the panel discussion I was the only panelist with a somewhat optimistic view founded on two points. My first point was that the older I get, the more I appreciate my inability to predict the future. Therefore, I have given up trying to predict the future and have instead decided to

focus on trying to shape the future by educating and developing the next generation. My second point was that the students I work with are really good, they have a clear vision for a better future, and they want to dedicate their professional careers to realizing this vision. More fully, I said that I realize the challenges in front of these students are immense, their success is by no means pre-ordained, and I do see a real risk of failure. However, my expectation is that these students will be creative, work hard, and surprise all of us by creating solutions to today’s societal challenges that we could never dream of, and in the process they will create and bequeath a new set of large and interesting societal challenges for the following generation to solve.

Sustainable Development and Bilkent Law: Think again about your vision for a sustainable world. Did you narrowly focus on how we use natural resources and interact with the environment? Or did you imagine a sustainable world in a broader sense that, for example, includes a fair and just society? While most of Our Common Future addresses global challenges related to the environment and energy, the book also addresses, for example, Conflict as a Cause of Unsustainable De-

velopment and Proposals for Institutional and Legal Change. The United Nations (UN) built on Our Common Future by defining 17 Sustainable Development Goals (SDGs) that were adopted by all UN Member States in 2015. In addition to SDGs related to the environment and energy (e.g. 6. Clean Water and Sanitation, 7. Affordable and Clean Energy, and 13. Climate Action), the following SDGs were defined: 1. No Poverty, 4. Quality Education, 5. Gender Equality, 10. Reduced Inequalities, and perhaps most important for the present audience, 16. Peace, Justice, and Strong Institutions. On 21 January 2021, I watched a video of Amanda Gorman reciting her poem The Hill We Climb. When she read the lines “... while we have our eyes on the future, history has its eyes on us” my mind first turned to you, the students studying law at Bilkent University, and then my mind turned this line to “... while you have your eyes on the future, history has its eyes on you.”

About the author: Derek Baker is a Full Professor in Mechanical Engineering at Middle East Technical University (METU) and a senior researcher in the Concentrating Solar Thermal (CST) research division ODAK at the Center for Solar Energy Research and Applications (METU-GÜNAM). He is coordinating the multi-national European Union Horizon 2020 (H2020) CST project SolarTwins (Grant: 856619) that includes the globally leading CST partners CIE-MAT-PSA (Spain) and DLR (Germany). He is Turkey’s main scientific contact for the CST European Research Infrastructure Consortium (ERIC) EU-SOLARIS. He is METU-GÜNAM’s principle investigator for the multi-national H2020 projects HORIZON-STE, SFERA-III, and GeoSmart, and was a researcher on the recently completed multi-national H2020 CST INSHIP project. He created the bottom-up national initiative ODAKTR to sup-



port Turkey's energy transition and transition to a green economy by developing and exploiting domestic resources and technologies. He also created the bottom-up national initiative UFUKTR to raise awareness of national legal and regulatory barriers that restrict the ability of Turkish state universities to bring competitive EU research funds to Turkey and participate in EU research, and therefore that more fundamentally weaken the competitiveness of Turkey's Research and Innovation ecosystem.

ENERJİ KULLANIMININ ÇEVRESEL ETKİLERİ VE KÜRESEL ENERJİ POLİTİKALARI ÇERÇEVESİNDE SÜRDÜRÜLEBİLİR ÇÖZÜMLER

Av. Derya AYDEMİR

Enerji, insanların yaşamlarını sağlıklı, güvenli ve rahat bir şekilde sürdürebilmeleri için gerekli temel ihtiyaçlardan. Ateş ve hayvan gücüyle başlayan enerji tüketimi, kömürle devam etmiş, zamanla makineler devreye girmiştir. Bugün ise çeşitli kaynaklardan enerji üretilmektedir. Bu enerji; ısıtmada, aydınlatmada, elektrikli aletlerin çalıştırılmasında, taşımacılıkta ve sanayi gibi birçok alanda kullanılmaktadır. Enerji tüketimi çevresel problemler ile birlikte sürdürülebilir gelişme açısından da olumsuzluk ortaya çıkarmaktadır. Bu yazının amacı; enerji kaynaklarının kullanımının çevresel etkileri ve yenilenebilir enerji gereksinimini sürdürülebilir kalkınma parametreleri açısından ele alarak değerlendirmektir.

Enerji günümüzde bütün sektörlerin en temel girdilerinden biridir. Sosyo-ekonomik büyüme, siyasi gelişmeler, şehirleşme, nüfus hareketi ve gelişen teknolojiye bağlı olarak enerji talebi her geçen gün artmaktadır. Bu taleple birlikte yaşam alanımızda çok farklı değişim ve gelişmel-

er olmaktadır, bunun bir sonucu olarak da doğal denge bozulmakta ve canlılar zarar görmektedir. Fazla enerji kullanımı daha fazla karbon emisyonu anlamına gelmektedir ve karbon emisyonunun artması çevre kirliliğine neden olmaktadır. Geline noktada karbon emisyonlarının çevreye verdiği zararlar önemli boyutlara ulaşmıştır. Karbon emisyonlarının büyük bir bölümü enerji sektöründe fosil kaynakların kullanımından kaynaklanmaktadır ve enerji tüketimi arttıkça karbon emisyonları da artmaktadır. Diğer taraftan günümüzde artan petrol ve doğalgaz fiyatları ve enerji güvenliğinin sağlanması gerekliliği nedenleriyle enerjinin çeşitlendirilmesi enerji politikalarının vazgeçilmez unsurlarından biri haline gelmiştir. Aynı zamanda fosil yakıtların rezervlerinin sınırlı olması ve çevre bilincinin artmasına bağlı olarak yenilenebilir enerji kaynakları daha da önemli hale gelmiştir. Enerji kullanımının çevreye verdiği zararların azaltılması için yenilenebilir enerji kaynaklarının etkin ve verimli bir şekilde kullanılması gerekmektedir. Özellikle hidrolojik enerji, rüzgâr enerjisi ve jeotermal enerji alanlarında önemli ölçüde yenilenebilir kaynaklara yönelmek gerekir. Enerji politikalarının oluşturulması ve uygulanması sırasında sürdürülebilir olmaları ve sürdürülebilirliğin bir ögesi olan enerji güvenliğini sağlamaları da önemlidir. Tüm bu faktörler yenilenebilir enerji kaynaklarının da enerji yelpazesinde yer almasına yol açmıştır.

Konunun bu kadar önemli olmasının nedeni, başta ekonomik nedenler olmak üzere dünyanın karşı karşıya kaldığı iki büyük sorundur. Bunlardan birisi sosyo-ekonomik bir problem olan sürdürülebilir kalkınma sorunu, diğeri ise küresel ısınma ve iklim değişikliği sorunudur. Sürekli ve dengeli kalkınmayı sağlamak ve insanlar için kaliteli yaşam çevreleri oluşturmak için, devletlerin

sürdürülebilir olmayan üretim ve tüketim kalıplarını azaltması ve ortadan kaldırması gerekmektedir. Ülkelerin yeşil enerjiyi benimseme konusunda ve sürdürülebilir kalkınma ile tutarlı olmayan enerji türlerini desteklememesi gerekir. Yenilenebilir enerji, doğanın kendi evrimi içinde, bir sonraki gün aynen mevcut olabilen enerji kaynağını ifade eder. Fosil kaynaklı (kömür, petrol ve karbon türevi) olmayan, elektrik enerjisi üretilirken karbondioksit emisyonu az bir seviyede gerçekleşen, çevreye zararı ve etkisi konvansiyonel enerji kaynaklarına göre çok daha düşük olan, sürekli bir devinimle yenilenen ve kullanılmaya hazır olarak doğada var olan hidrolik, rüzgâr, güneş, jeotermal, biokütle, biyogaz, dalga, akıntı enerjisi ve gelgit hidrojen gibi enerji kaynaklarını kapsamaktadır. Yenilenebilir enerji kaynaklarının düşük karbon ekonomisine geçme amacıyla kullanımını dünya genelinde her geçen gün daha da yaygınlaştırmaktadır.

Sürdürülebilir kalkınma ise ekonomik, çevresel ve sosyal olmak üzere üç boyutta sürdürülebilirliği kapsamakta olup, birbirini tamamlayan farklı boyutlar arasındaki ilişkiyi ve bunlar arasında denge kurma zorunluluğunu ifade etmektedir. "Sürdürülebilir" veya "sürdürülebilirlik," dünyada yaşanan küresel ısınmanın sonuçlarında var olan kaynakların değişmesi ve tükenmesini baz almıştır. Sürdürülebilirlik, "üretilebilir yeteneğinin yakın gelecekte korunması" olarak tanımlanmaktadır. Sürdürülebilir kalkınmanın sağlanması; yaşam standartlarının iyileştirilmesi ve ekonomik ya da üretime yönelik etkinliklerin gerçekleştirilebilmesi için, nüfus artışı ve ekonomik büyüme nedeniyle giderek artan enerji gereksiniminin karşılanmasını gerekli kılmaktadır. Sürdürülebilir enerji kavramı ise; tüm birincil enerji kaynaklarından yapılan enerji üretiminin yüksek verimle ve temiz teknolojilerle gerçekleştiril-

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