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## Rethinking Nature, Crisis and Complexity after the Pandemic

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### Introduction: The virosphere in flux

The COVID-19 crisis is evolving into a long-term development emergency, the scale of which is unprecedented in modern times. Among the root causes of the crisis is humanity's breaching of the planet's ecological boundaries. COVID-19 is likely a zoonotic disease, a disease passed from animals to humans. As pressures on natural ecosystems and wildlife intensify, channels of viral outbreak have accelerated in recent years, as also seen in outbreaks of other zoonotic diseases such as Ebola, SARS and MERS in recent years. More than ever, the ability to prevent outbreaks depends on our ability to maintain healthy ecosystems and avoid the blurring of ecological boundaries.

One of the oldest life forms on Earth, viruses have been a key component of the world's ecosystems for hundreds of millions of years and have played an important role in the evolution of the planet's ecosystems.<sup>2</sup> They constitute one of the most abundant life forms on the planet, with this vast unseen component of the world's ecosystems – the virosphere – influencing climatic and geochemical cycles and having co-evolved with other species, including humanity.<sup>3</sup> Far from a 'black swan' event, today's COVID-19 outbreak had been long predicted. The global pandemic is a clear warning sign of the implications of breaching planetary boundaries, with more than 75% of new diseases in recent decades being zoonotic spread between animals and humans.<sup>4</sup> But as devastating as

the current crisis has been and continues to be, such outbreaks are likely to continue and even escalate on the road to 2030 and beyond, unless development pathways and our relationship with nature are remade.

Reducing the intensity of development's ecological footprint is central to ensuring the resilience of the biosphere, with healthy and diverse ecosystems more resilient to shocks. "Diversity builds and sustains insurance and keeps systems resilient to changing circumstances."<sup>5</sup> The rapid emergence and frequency of novel virus outbreaks in recent decades is one example of the implications for the future of civilization, with the global reach and impact of COVID-19 and the rapid reversal of development gains a stark reminder of how ecological fragility and complexity plays out in nature.<sup>6</sup> COVID-19 will not be the last major outbreak of a zoonotic disease in our lifetimes. Rather than awaiting the next outbreak, action is needed towards the sustainable use and restoration of ecosystems. This is not so much an environmental endeavour as it is an act of preventing crises and future-proofing the hard-won progress on development that countries have made.<sup>7</sup>

As countries around the world plan aggressive responses to COVID-19, an opportunity exists to mainstream green recovery solutions into the

process, so that results in combatting poverty and inequality can withstand accelerating ecological impacts in the future. This year's critical United Nations summits on the planetary crisis offer a timely opportunity to review these challenges and advance tangible solutions.<sup>8</sup> To this end, this paper looks at the case of the Middle East and

North Africa (MENA), in many ways at the forefront of multi-dimensional risk and where trends of conflict, displacement and rising poverty have been exacerbated by the region's position as the most water-insecure, food-import-dependent part of the world, and where temperatures are rising faster than the world average owing to climate change.

## Crisis and Transformation in the MENA Region

The interplay between nature, complexity and crisis is far from a new phenomenon in the Middle East and indeed dates to the origins of civilization. The region saw the rise of the world's first agricultural civilizations and city-states, in many ways functioning as hubs of multi-species convergence with a concentration of people, animals and viruses never seen before. This led to rapidly shifting routes of viral transmission and generated what were thought to be some of the world's first major outbreaks of zoonotic diseases.<sup>9</sup>

Viruses have played a key role in the rise and fall of ancient civilizations in the region over millennia, with the converging forces of climatic shifts, resource insecurity, conflicts and pandemics likely behind a number of transitions throughout the region's history.<sup>10</sup> In many ways the history of the region has been one of resilience, with societies having been able to adapt and transition over thousands of years to new pathways following complex crises.

While the lessons from deep history are key in understanding the nexus of nature, complexity and crisis in the region, the changes underway today are occurring at a pace unlike anything before, stretching the ability of communities and states to cope and positively adapt.

Over the past decade, the region has witnessed an unprecedented convergence of crises — onset of one of the worst drought cycles in almost one thousand years, the systemic changes brought on by the Arab uprisings, one of the most dramatic outbreaks of conflict and mass displacement in modern times, and the emergence of the Middle East Respiratory Syndrome (MERS) — the last major coronavirus outbreak before COVID-19. Importantly, these crises were amplified by an ecological crisis which, if left unchecked, will accelerate further in coming years — reshaping the future of development in the region and presenting major challenges for the prospect of a resilient recovery.

## A Climate-Resilient Recovery

Climate change poses one of the greatest threats to the future of development in the MENA region and could well undermine a long-term recovery from COVID-19.<sup>11</sup> Already a global hotspot of climate risk, temperatures in the region are rising faster than the world average, threatening to further reduce renewable water resources by 20% by 2030,<sup>12</sup> with millions at further risk from climate-induced displacement.<sup>13</sup> Temperatures in the region are expected to increase by up to 5°C by 2100.<sup>14</sup> While climate change will continue to accelerate, it has already had devastating consequences across the region. The 2008–2009 economic crisis, for example, converged with accelerating climate impacts and resource insecurity, occurring during one of the worst drought cycles experienced by the region in almost a thousand years.<sup>15</sup> This combination of economic and climate crises generated unprecedented levels of social vulnerability and instability in advance of the Arab uprisings.<sup>16</sup>

Today, impacts and risks once again converge, with particular challenges for poor and displaced communities for whom COVID-19 and the economic and climate crises pose a threat to lives and livelihoods. Already in 2020–21, many communities have faced mounting economic pressures alongside the emergence of climate induced disasters. 2020 was one of the hottest years on record for the region, alongside an unprecedented outbreak of locusts driven in part by climate change.<sup>17</sup> Vulnerabilities have been especially serious in conflict affected areas of the region, where communities suffer displacement from both climate and conflict, leading to a growing awareness in the region of the role of climate change as a threat to peace and security.<sup>18</sup> The severity of the economic crisis catalysed by the pandemic must not distract decision-makers from the converging forces of climate fragility, with a need to advance more ambitious climate action and craft climate-resilient recovery pathways.<sup>19</sup>

An opportunity exists to integrate climate adaptation into the recovery of key economic sectors as a means of building back better and ensuring results that are able to withstand future climate shocks — especially with more frequent and severe droughts, floods and storms expected in coming years.<sup>20</sup> Climate solutions can be mainstreamed into new capital injection and fiscal stimulus measures to support the recovery of MSMEs as well as key climate-vulnerable sectors at the centre of economic recovery goals such as agriculture, tourism, and infrastructure.<sup>21</sup> Innovative solutions can also be applied to the challenge of mounting debt, with ‘debt-for-climate swaps’ one option to offset debt repayments with domestic investments into climate resilient solutions.<sup>22</sup> Unless climate adaptation is integrated from the outset, the climate crisis will jeopardize results within the region’s recovery.

An opportunity also exists during the recovery process to link crisis recovery with new policies and financial instruments affiliated to the Paris Agreement.<sup>23</sup> Ongoing processes to enhance Nationally Determined Contributions (NDCs) on the road to climate COP26 in 2021 and to enact new National Adaptation Plans are opportunities to align climate investments with the socio-economic imperatives arising from COVID-19 and the economic crisis.<sup>24</sup> The climate agenda can serve as a strategic platform at the country level to crowd-in public and private investments for a

climate-resilient economic recovery. To this end, UNDP is scaling up support to help countries raise ambition within NDC enhancement and NAP development processes in places like Egypt, Iraq, Jordan, Lebanon, Morocco, Somalia, and Sudan. In addition to setting an enabling policy environment for action, UNDP support also helps build the public-private partnerships needed to scale up finance and bring co-benefits for goals of poverty reduction, women’s empowerment and recovery from the pandemic.

Today, UNDP has approximately \$125 million of grants ongoing and planned for countries in the MENA region on climate adaptation, with a particular focus on communities facing the converging impacts of climate, displacement, and COVID-19. With financial support of the Green Climate Fund (GCF), the Global Environment Facility (GEF), the Adaptation Fund (AF), the Least Developed Country Fund (LDCF), SIDA, and others, UNDP initiatives help countries generate new climate-resilient infrastructure, early-warning systems to better manage risks from climate induced disasters, and climate-resilient agriculture and water systems to combat poverty and food insecurity.<sup>25</sup> These initiatives can help partners achieve the goals of the Paris Agreement on climate change and national NDC climate plans while also future-proofing the recovery from COVID-19.

## The Solar Transition

As the global community comes to grips with the converging demands to re-energize the economy and combat the climate crisis, strong momentum has emerged towards diversification beyond the conventional fossil-fuel economy and accelerating the transition to the solar economy.<sup>26</sup> The renewable-energy sector has been among the bright spots in 2020-21, the only energy sector to witness positive growth in 2020 building on its cost-effectiveness and strategic value in an increasingly carbon-constrained world.<sup>27</sup> Despite these trends, the current economic crisis brings risks for a clean-energy future, with reductions in oil prices, foreign investment, public budgets and private finance.<sup>28</sup>

The MENA region faces both challenges and a major opportunity in this regard. While challenges exist in overcoming entrenched dynamics around the region’s oil-based rentier economy, solar is increasingly seen as a strategic asset for building the knowledge-based, high-tech, youth-

employment-generating economy of the future. Aligning solar solutions with the recovery from COVID-19 can help accelerate such a transition, building on the role that renewable energy has played in crisis recovery in the MENA region over the past decade.

Solar and wind energy capacities increased more than ten-fold in the decade since the 2008-2009 global crisis and the 2010-2011 Arab uprisings, rising from a combined 0.5 gigawatts (GW) in 2008 to about 7.2 GW by 2018.<sup>29</sup> An important foundation for the rise of renewable energy in the region has been the National Renewable Energy Action Plans (NREAPs) that MENA countries have enacted in recent years. Ambitious targets and innovative policies now exist across the region as a base for attracting private investment, enhancing energy subsidies, establishing renewable energy institutions and renewable energy development zones. Through these plans, countries have set

a cumulative target in the MENA region to reach 190 GW of renewable energy capacity by 2035, expected to account for as much as 30% of overall global growth opportunities in the renewable energy sector in coming years.<sup>30</sup>

The unprecedented surge of renewable-energy capacity in the region over the past decade has helped advance the region's aspirations to move beyond the oil export-based model of development, reduce the carbon-intensity of growth, and expand energy access for crisis-affected communities. Even in oil-exporting economies of the region, solar solutions have emerged as a way to reduce reliance on oil for rapidly expanding local electricity needs, saving billions of dollars in future oil-export revenues.<sup>31</sup>

Maintaining this strong momentum, however, will require dedicated measures to mainstreaming solar solutions into new recovery investments, so that countries' hard-won gains in solar expansion over the past decade are not lost as a result of the emerging economic downturn following COVID-19. This can help expand energy access for poverty reduction, livelihoods and green jobs, close the chronic energy gaps faced by vulnerable communities across the region, and reduce air pollution as a major source of underlying respiratory conditions and health risks.<sup>32</sup> Decentralized solar solutions can play a particularly important role in communities impacted by both conflict and the economic fall-out of the pandemic — ensuring energy access for health facilities and other critical public services, lower energy costs for rural agriculture, and cost-

effective power for regenerating local MSMEs and livelihoods.

To this end, UNDP manages over \$150 million of grants in the MENA region on sustainable energy, with important co-benefits to emerge towards a resilient recovery from the pandemic and economic crisis. Through support of the Global Environment Facility (GEF), for example, solar mini-grids are planned in places like Djibouti, Egypt, Somalia, and Sudan to expand energy access for poverty reduction and community resilience, while investments and results are being scaled up to advance low-carbon sustainable city models in Egypt, Iraq, Jordan, and Morocco. In oil-exporting countries of the region like Algeria and Libya, initiatives are emerging to support energy-transition strategies, while in Bahrain and Saudi Arabia UNDP initiatives financed by local partners help reduce the energy intensity of growth and accelerate renewable-energy and energy-efficiency results.

A number of strategic initiatives are also underway specifically dedicated for communities affected by conflict and displacement. In Yemen, Lebanon, Palestine, Sudan, and Somalia, and through the support of the European Commission, South Korea, Japan and other donors, these initiatives help restore energy access for MSMEs, health facilities and schools, and irrigation and agricultural livelihood needs.<sup>33</sup> These and other initiatives help countries advance sustainable-energy pathways while generating clear co-benefits for a resilient recovery from converging impacts of the pandemic, conflicts, and economic crisis.

## Restoring Ecosystems

Ecosystems across the Arab region have been under mounting pressure in recent years, with over one thousand threatened species in the region today, most of which are classed as 'critically endangered.'<sup>34</sup> Communities and the ecosystems on which their livelihoods depend have been battered by expanding and unrelenting pressures from war, urbanization, industrialization, and climate change. As a resource-scarce region, the ability to maintain and sustain critical ecosystems is vital for the health and well-being of local communities.

Declining ecosystems not only endanger the species they host — they also seriously affect human health and welfare.<sup>35</sup> As pressures mount on natural habitats, animals are pushed closer to

human communities, increasing the risk of disease transmission. Before COVID-19, the last major coronavirus outbreak of global concern was the Middle East Respiratory Syndrome (MERS).<sup>36</sup> Action to enhance the sustainable use and management of ecosystems in the region is critical to reducing the risk of future zoonotic outbreaks.

Alongside general challenges of ecosystem fragility, a specific issue facing communities — and the poor in particular — is access to water.<sup>37</sup> COVID-19 has been a stark reminder of the centrality of water for the resilience of development pathways. The pandemic resulted in a five-percent increase in water demand owing to increased hygiene practices, with rising demand adding pressures on already scarce water

systems.<sup>38</sup> The average person in the region receives just one-eighth the renewable water of the global average, while 18 of the 22 Arab countries face water scarcity.<sup>39</sup> Over 70 million people in the region suffer from lack of regular household water, in addition to over 26 million displaced persons in or from conflict-affected countries.<sup>40</sup> Lack of water access has limited the ability to prevent community spread of COVID-19 and the ability of health facilities to provide emergency services. The situation is particularly severe in conflict-affected countries, where destruction of water systems has led to cholera and other diseases.

Lack of water access also serves as a barrier to broader recovery goals, with water being a key input for MSMEs and the agriculture and manufacturing sectors. Water demand across the region has been on the rise, with the deficit expected to increase to 75.4 billion cubic meters (bcm) by 2030 from just 28.3 bcm in 2000.<sup>41</sup> Waste management services have also come into strong focus as a result of the pandemic. The need to safely dispose of medical waste has increased dramatically,<sup>42</sup> as has the use of plastic and other disposable protection.<sup>43</sup> Billions of masks and gloves are being consumed and disposed of in the region, with corresponding risk to the region's freshwater and marine ecosystems.<sup>44</sup>

Water conservation and waste management actions should be prioritized as part of broader recovery policies and investments, focused on restoring basic access to water and waste services in communities affected by the converging impacts of war and the improvement of water governance and reuse and waste management and recycling more generally across the region. The unsustainable use of ecosystems, combined with chronic deficits in key services such as water and

waste management, have put many communities at greater risk of pandemic impacts while also generating barriers to a resilient recovery. This is particularly important for communities in the region displaced by conflict for whom the resumption of development pathways depends on access to natural assets.

As countries move ahead with recovery plans and investments, a focus on improving ecosystem management, water access and waste management can help build community resilience while mitigating risks to the sustainability of the results of socio-economic recovery. UNDP implements over \$100 million of grants in the MENA region for sustainable use of biodiversity, ecosystem restoration, and expanding access to water and waste services. In contexts of conflict and displacement like Yemen, Syria, Somalia, Palestine, Libya, and Iraq, UNDP, with the support of bilateral donors, helps restore access to critical water and waste services damaged by war. Access to these services is re-established for households, businesses, health facilities, schools, and other facilities.<sup>45</sup>

Through support of the Global Environment Facility (GEF), a number of initiatives are also underway in Algeria, Egypt, Jordan, Lebanon, Morocco, Somalia and Sudan to conserve biodiversity, restore ecosystems and improve the use of groundwater, while generating co-benefits for community livelihoods and sectors critical for an economic recovery from COVID-19 like agriculture and tourism. The launch in 2021 of the UN Decade of Ecosystem Restoration and the new post-2020 Global Framework on Biodiversity will be key platforms to further scale up actions in the region in coming years to build the resilience of communities and ecosystems.<sup>46</sup>

## Conclusion: Development as a Socio-Ecological System

A key take-away from the pandemic is this: our ability to prevent the complex crises affecting the world today rests on our ability to reset our relationship with nature. In pursuing a resilient recovery from COVID-19 a priority must be to pursue a new generation of development models and policies that put nature at the center. In addition to expanding technical assistance to crisis-affected communities to build back greener and better, the crisis is also an opportunity to rethink conventional models of development, long complicit in the destruction of ecosystems and the rapid acceleration of zoonotic outbreaks. In building back better, a need exists to reimagine development in a way that can achieve the vision of the 2030 Agenda for a new balance between people and planet.

Development is no longer a purely socio-economic enterprise based on the linear ascent of countries and individuals to developed status and the rapid achievement of social-welfare goals. Rather, the nexus of nature, crisis and complexity makes it clear, today more than ever, that development is the emergent outcome of a complex socio-ecological system, with development outcomes shaped by a growing proliferation of 'entanglements' between ecology and society.<sup>47</sup> The convergence of the pandemic with climate change and ecological fragility is catalyzing decision-makers to look beyond sectoral, linear approaches to policy.

New nature-based, risk-informed development pathways are needed, to foster robust development outcomes and institutions, capacities for adaptability, and the ability to transform and manage system-wide shifts when socio-ecological tipping points are breached.<sup>48</sup> "Adaptation refers to human actions that sustain development on current pathways. Transformation is about shifting development into new pathways and even creating novel ones."<sup>49</sup> Transformation refers to "the capacity to create fundamentally new systems of human-environmental interactions and feedbacks when ecological, economic, or social structures make the continuation of the existing system untenable."<sup>50</sup>

The road to 2030 can be defined by more frequent and severe ecological crises and pandemics, or we can reset our trajectory towards sustainability and resilience. "Whether humanity has the collective wisdom to navigate the Anthropocene to sustain a livable biosphere for people and civilizations, as well as for the rest of life with which we share the planet, is the most formidable challenge facing humanity."<sup>51</sup> "In the twenty-first century, people and planet are truly interwoven and coevolve, shaping the preconditions for civilizations. Our own future on Earth, as part of the biosphere, is at stake."

In many ways the MENA region has been on the global frontlines of the challenge of managing multi-dimensional crises. But while much attention has been placed in recent years in the region toward building resilience of systems to conflict and displacement, less attention has been placed on the need to ensure the 'ecological safety net' on which recovery and development goals will ultimately rest. We must also ensure the resilience of ecosystems, through a new generation of development policies and institutions to catalyze a transition from a legacy model of development founded upon an extractive utilitarian orientation, to one based on socio-ecological resilience.

Today, the region is already one of the world's hotspots of multi-dimensional crisis. But solutions exist and are in our hands, if we act with resolve, adopting new values and new institutions. UNDP is today the UN system's largest implementor of grant assistance for environmental sustainability in the MENA region, with over \$500 million of grants ongoing and planned for countries across the region.<sup>52</sup> We stand ready to work with our partners on this agenda of transformational change — helping partners rethink development trajectories, and generate new capacities for a post-pandemic recovery founded on the resilience of communities and ecosystems.

## Endnotes

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- <sup>2</sup> Ricard Sole and Santiago Elena (2019), *Viruses as Complex Adaptive Systems*, Princeton University Press, Princeton, US at 14.
- <sup>3</sup> Ibid, xi.
- <sup>4</sup> Bradshaw CJA, Ehrlich PR, Beattie A, Ceballos G, Crist E, Diamond J, Dirzo R, Ehrlich AH, Harte J, Harte ME, Pyke G, Raven PH, Ripple WJ, Saltré F, Turnbull C, Wackernagel M and Blumstein DT (2021) *Underestimating the Challenges of Avoiding a Ghastly Future*. *Front. Conserv. Sci.* 1:615419. See also: Austin, K. F. (2020). *Degradation and disease: ecologically unequal exchanges cultivate emerging pandemics*. *World Dev.* 137:105163. Daily, G. C., and Ehrlich, P. R. (1996). *Global change and human susceptibility to disease*. *Ann. Rev. Energ. Environ.* 21, 125–144. Daszak, P., das Neves, C., Amuasi, J., Hayman, D., Kuiken, T., Roche, B., et al. (2020). *Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services*. Bonn: IPBES Secretariat. Dobson, A. P., Pimm, S. L., Hannah, L., Kaufman, L., Ahumada, J. A., Ando, A. W., et al. (2020). *Ecology and economics for pandemic prevention*. *Science* 369, 379–381. Roe, D., Dickman, A., Kock, R., Milner-Gulland, E. J., Rihoy, E., and Sas-Rolfes, M. (2020). *Beyond banning wildlife trade: COVID-19, conservation and development*. *World Dev.* 136:105121.
- <sup>5</sup> Carl Folke, Stephen Polasky, Johan Rockstrom, Victor Galaz, Frances Westley, Michele Lamont, Marten Scheffer, Henrik Osterblom, Stephen R. Carpenter, F. Stuart Chapin III, Karen C. Seto, Elke U. Weber, Beatrice I. Crona, Gretchen C. Daily, Partha Dasgupta, Owen Gaffney, Line J. Gordon, Holger Hoff, Simon A. Levin, Jane Lubchenco, Will Steffen, Brian H. Walker, *Our future in the Anthropocene biosphere*, *Ambio* 2021, 50:834–869 at 843. See also: Hendershot, J.N., J.R. Smith, C.B. Anderson, A.D. Letten, L.O. Frishkoff, J.R. Zook, T. Fukami, and G.C Daily. 2020. *Intensive farming drives long-term shifts in community composition*. *Nature* 579: 393–396. Folke, C., S.R. Carpenter, B. Walker, M. Scheffer, T. Elmqvist, L. Gunderson, and C.S. Holling. 2004. *Regime shifts, resilience, and biodiversity in ecosystem management*. *Annual Review of Ecology, Evolution and Systematics* 35: 557–581. Hooper, D.U., F.S. Chapin III., J.J. Ewel, A. Hector, P. Inchausti, S. Lavoret, J.H. Lawton, D.M. Lodge, et al. 2005. *Effects of biodiversity on ecosystem functioning: A consensus of current knowledge*. *Ecological Monographs* 75: 3–35. Tilman, D., F. Isbell, and J.M. Cowles. 2014. *Biodiversity and ecosystem functioning*. *Annual Review of Ecology, Evolution, and Systematics* 45: 471–493.
- <sup>6</sup> See: Myers, S.S., and J.J. Patz. 2009. *Emerging threats to human health from global environmental change*. *Annual Review of Environment and Resources* 34: 223–252
- <sup>7</sup> See: Kishan Khoday, *Climate, COVID-19 and Planetary Health*, UNDP, 20 April 2020 (<https://www.sdgintegration.undp.org/climate-covid-19-and-planetary-health>).
- <sup>8</sup> Key summits in 2021 include: the High-Level Political Forum on Sustainable Development (HLPF), the 26th Conference of the Parties to the UNFCCC (COP26), the 15th Conference of the Parties to the UNCBD (COP15), the UN High-Level Dialogue on Energy and the UN Food Systems Summit (FSS).
- <sup>9</sup> James Scott, *Against the Grain: A deep history of the earliest states*, Yale University Press, New Haven, USA at 100-05.
- <sup>10</sup> Ibid, 96-97.
- <sup>11</sup> Carly Phillips Astrid Caldas, Rachel Cleetus, et al., *Compound Climate Risks in the COVID-19 Pandemic*, Nature Climate Change, 2020.
- <sup>12</sup> Economic and Social Commission for West Asia (ESCWA), *Arab Sustainable Development Report*, ESCWA, Beirut, 2020, p. 168.
- <sup>13</sup> UNDP, *Climate Change Adaptation in Arab States: Best Practices and Lessons Learned*, UNDP, New York, 2018.
- <sup>14</sup> ESCWA, *Arab Sustainable Development Report*, ESCWA, Beirut, 2020, p. 171. See also ESCWA, *Arab Climate Change Assessment Report*, ESCWA, Beirut, 2017.
- <sup>15</sup> Benjamin Cooke, et al., *Spatiotemporal drought variability in the Mediterranean over the last 900 years*, *JGR Atmospheres*, Volume 121, Issue 5, 2016, pp. 2060–2074, Wiley Publishers.
- <sup>16</sup> Kishan Khoday, *Sustainable Development as Freedom: Climate Change, Environment and the Arab Uprisings*, Background Paper for the Arab Development Challenges Report, UNDP Regional Center in Cairo, 2012.
- <sup>17</sup> See: Caline Malik, *Locust swarms pose new threat to Middle East and Africa's Food Security*, 5 February 2021, Arab News (<https://www.arabnews.com/node/1804536/middle-east>). See also FAO, *Desert Locust Crisis Appeal*, FAO, Rome, 2021. See also Nelson Mandelo Ogema and Fiona Broom, *Famine risk for millions in second locust wave*, 28 May 2020, SciDev.net (<https://phys.org/news/2020-05-famine-millions-locust.html>).
- <sup>18</sup> Jamal Saghir, *Climate Change and Conflicts in the Middle East and North Africa*, Working Paper, American University in Beirut, 2020; Dan Smith and Florian Krampe, *Climate Related Security Risks in the Middle East*, in *Routledge Handbook on Middle East Security*, Routledge, UK, 2019. Dan Smith, Malin Mobjörk, Florian Krampe and Karolina Eklöv, *Climate Security*, Clingendael Institute, Hague. See also Kishan Khoday, *Climate Change, Peace and Security*, 31 October, 2019, UNDP New York (<https://medium.com/@UNDPArabStates/climate-change-peace-and-security-f5a290b6d28c>).
- <sup>19</sup> See: Mara Bieler, Sanya Bischoff and Oliver Melches, *COVID-19: How to Integrate Crisis Management with Transformative Climate and Sustainability Action*, GLZ, Bonn, 2020.
- <sup>20</sup> See: Joaquim Levy, Carter Brandon, and Rogerio Studart, *Designing the COVID-19 Recovery for a Safe and More Resilient World*, WRI, Washington, DC, 2020.
- <sup>21</sup> Kishan Khoday, Chapter 10 on Climate Change, Sustainable Energy and the Environment in *Compounding Crises: Will COVID-19 and Lower Oil Prices Prompt a New Development Paradigm in the Arab Region*, UNDP, New York p. 147-154.
- <sup>22</sup> Vikram Widge, *Debt for climate swaps – are they really a good idea, and what are the challenges?* Devex, 5 Jan 2021 (<https://www.devex.com/news/opinion-debt-for-climate-swaps-are-they-really-a-good-idea-and-what-are-the-challenges-98842>).
- <sup>23</sup> UNDP and Secretariat of the United Nations Framework Convention on Climate Change, *NDC Global Outlook Report 2019: The Heat is On*, UNDP, New York, 2019.
- <sup>24</sup> See: Climate Action Tracker, *A Government Roadmap for Addressing the Climate and post COVID-19 Economic Crises*, Climate Analytics and New Climate Institute, Berlin, 2020. Stanley Center and E3G, *Global Financial Crisis and Climate Change – A Playbook for Action*, Stanley Center for Peace and Security and E3G, Washington, DC, 2019.
- <sup>25</sup> UNDP, *Transformation Towards Sustainable and Resilient Societies: Ecosystem Resilience for SDG Achievement and Human Security in the Arab Region*, UNDP Regional Hub for Arab States, Amman, 2019. UNDP, *Climate Change Adaptation in Arab States: Best Practices and Lessons Learned*, UNDP, New York, 2018.
- <sup>26</sup> Achim Steiner and Francesco La Camera, *Turning the Page on the Age of Oil*, Euractiv, 14 May 2020 (<https://www.euractiv.com/section/development-policy/opinion/turning-the-page-on-the-age-of-oil/>).
- <sup>27</sup> IEA, *World Energy Investment 2020*, International Energy Agency, Paris, 2020.
- <sup>28</sup> Kishan Khoday, Chapter 10 on Climate Change, Sustainable Energy and the Environment in *Compounding Crises: Will COVID-19 and Lower Oil Prices Prompt a New Development Paradigm in the Arab Region*, UNDP, New York p. 150-152.
- <sup>29</sup> UNDP and CREEE, *Arab Future Energy Index (AFEX) Report*, Regional Center for Renewable Energy and Energy Efficiency, Cairo, 2019.
- <sup>30</sup> Ibid.
- <sup>31</sup> Ibid. See also: Kishan Khoday and Stephen Gitonga, *Decarbonizing Development*, UNDP, 3 Dec 2018 (<https://www.arabstates.undp.org/content/rbas/en/home/ourperspective/ourperspectivearticles/2018/decarbonizing-development-in-the-middle-east.html>).
- <sup>32</sup> Arvind Kumar, Jane Burston and Josh Karliner, *The Deadly Link between COVID-19 and Air Pollution*, 15 April 2020, World Economic Forum, Geneva (<https://www.weforum.org/agenda/2020/04/the-deadly-link-between-covid-19-and-air-pollution/>).
- <sup>33</sup> UNDP, *Energy for Crisis Recovery: Solar Solutions for Crisis-Affected Communities in the Arab Region*, UNDP Regional Hub for Arab States, Amman, 2019. See also: UNDP, *SDG Achievement in Crisis Contexts: Climate Change, Energy and Nature Based Solutions for Conflict Affected Communities in the Arab Region*, UNDP Regional Hub for Arab States, Amman, 2019.

- <sup>34</sup> ESCWA, *Arab Sustainable Development Report*, ESCWA, Beirut, 2016, p. 117.
- <sup>35</sup> Abbas El-Zein, Samer Jabbour, Belgin Tekce, et al., Health and ecological sustainability in the Arab world: A matter of survival, *The Lancet*, 383, 2014, 458–476.
- <sup>36</sup> UNEP, *Zoonotic Diseases*, UNEP, Nairobi, 2020.
- <sup>37</sup> Kishan Khoday, Chapter 10 on Climate Change, Sustainable Energy and the Environment in *Compounding Crises: Will COVID-19 and Lower Oil Prices Prompt a New Development Paradigm in the Arab Region*, UNDP, New York p. 152-154
- <sup>38</sup> ESCWA, *The Impact of COVID-19 on the Water Scarce Arab Region*, ESCWA, Policy Brief 5, Beirut, 2020.
- <sup>39</sup> ESCWA, *Arab Sustainable Development Report*, ESCWA, Beirut, 2020, 86. See also: UNDP, *Water Governance in the Arab Region*, UNDP, New York, 2013.
- <sup>40</sup> ESCWA, *The Impact of COVID-19 on the Water Scarce Arab Region*, ESCWA, Policy Brief 5, Beirut, 2020, 2, 5.
- <sup>41</sup> ESCWA, *Developing the Capacity of Member Countries to Address the Water and Energy Nexus for Achieving the SDGs*, Regional Policy Toolkit, ESCWA, Beirut, 2016.
- <sup>42</sup> WHO, *Overview of technologies for the treatment of infectious and sharp waste from health care facilities*, World Health Organization, Geneva, 2019. UNDP, *Guidelines for Sustainable Procurement of Healthcare Commodities and Services*, UNDP, New York, 2020.
- <sup>43</sup> UNEP, *COVID-19 Waste Management Factsheet*, UNEP, Nairobi, 2020.
- <sup>44</sup> See: Kristin Hughes, *Protector or polluter? The impact of COVID-19 on the movement to end plastic wastes*, World Economic Forum, 6 May 2020 (<https://www.weforum.org/agenda/2020/05/plastic-pollution-waste-pandemic-covid19-coronavirus-recycling-sustainability/>).
- <sup>45</sup> UNDP, *SDG Achievement in Crisis Contexts: Climate Change, Energy and Nature Based Solutions for Conflict Affected Communities in the Arab Region*, UNDP Regional Hub for Arab States, Amman, 2019.
- <sup>46</sup> UNCBD, *Zero Draft of the Post-2020 Global Biodiversity Framework*, UNCBD, Montreal (<https://www.cbd.int/conferences/post2020/post2020-prep-01/documents>). See also: UNEP and FAO, *The UN Decade of Ecosystem Restoration Strategy*, UNEP, Nairobi (<https://www.decadeonrestoration.org/>).
- <sup>47</sup> Kishan Khoday, *Rethinking Development in an Era of Planetary Transformation*, Occasional Paper No.1 for the 2020 Human Development Report, Human Development Report Office, UNDP, New York. (<http://hdr.undp.org/en/content/rethinking-human-development-era-planetary-transformation-0>).
- <sup>48</sup> Jessica Flack and Melanie Mitchell, *Uncertain Times*, *American Scientist*, pp.372-73, Nov-Dec 2020.
- <sup>49</sup> Carl Folke, *Resilience*, Oxford Research Encyclopedia of Environmental Science, Oxford University Press, 2016.
- <sup>50</sup> Carl Folke, Stephen Polasky, Johan Rockstrom, Victor Galaz, Frances Westley, Michele Lamont, Marten Scheffer, Henrik Osterblom, Stephen R. Carpenter, F. Stuart Chapin III, Karen C. Seto, Elke U. Weber, Beatrice I. Crona, Gretchen C. Daily, Partha Dasgupta, Owen Gaffney, Line J. Gordon, Holger Hoff, Simon A. Levin, Jane Lubchenco, Will Steffen, Brian H. Walker, *Our future in the Anthropocene biosphere: Global sustainability and resilient societies*. Paper for the Nobel Prize Summit - Our Planet, OurFuture. Beijer Discussion Paper 272. Beijer Institute, Royal Swedish Academy of Sciences, Stockholm, *Ambio* 2021, 50: 834–869, 848.
- <sup>51</sup> *Ibid*, 834.
- <sup>52</sup> UNDP, *Transformation Towards Sustainable and Resilient Societies: Ecosystem Resilience for SDG Achievement and Human Security in the Arab Region*, UNDP Regional Hub for Arab States, Amman, 2019.