## CP

#### Counterplan text: States should increase Covax support, prioritise trade facilitation, commit to aid for trade, and invest in preparedness.

Gonzalez 21 [Violeta Gonzalez Behar is head of partnerships, communications, and resource mobilization at the Enhanced Integrated Framework, a sustainable trade multilateral partnership at the World Trade Organization. In this capacity, she leads a global team in helping EIF build strategic partnerships, communicate results, and secure financing for operations in 51 developing economies. “Opinion: 4 ways to promote vaccine equity through trade”. 8-1-2021. Devex. https://www.devex.com/news/opinion-4-ways-to-promote-vaccine-equity-through-trade-100457. Accessed 8-12-2021; MJen]

Vaccine inequity is one of the most striking — but solvable — challenges of the [COVID-19](https://www.devex.com/focus/covid-19) pandemic. It also provides a wake-up call for what can happen when so-called least-developed countries, or LDCs, are not able to participate fully in global trading systems. By supporting programs such as COVAX, advancing trade facilitation efforts, and directing more aid toward trade initiatives such as [Aid for Trade](https://www.wto.org/english/tratop_e/devel_e/a4t_e/aid4trade_e.htm), the global community can help right this imbalance. As of Monday, only [1.1 % of people in low-income countries](https://ourworldindata.org/covid-vaccinations) had received at least one COVID-19 vaccine dose. This is making it harder to battle a third wave of infections, as the highly transmissible [delta variant](https://news.un.org/en/story/2021/07/1095152) spreads across many nations. In the [World Health Organization](https://www.devex.com/organizations/world-health-organization-who-30562)’s Africa region — where a [high number](https://www.uneca.org/sites/default/files/com/2021/E2100045-English-CoM21-Progress-in-the-implementation-of-the-priority-areas-of-the-Programme-of-Action-for-the-Least-Developed-Countries-for-the-Decade-2011-2020_Istanbul-Programme-of-Action.pdf) of LDCs are located — COVID-19 fatalities [surged 44.2%](https://apps.who.int/iris/bitstream/handle/10665/342715/OEW28-0511072021.pdf) over one week in July. The coronavirus is [devastating](https://www.un.org/development/desa/dpad/2021/major-study-on-covid-19-impact-on-ldcs-released/) many LDCs’ already fragile economies and causing poverty and inequality to rise. Without equitable access to vaccines, [global economic recovery cannot be sustained](https://www.wto.org/english/news_e/news21_e/gc_05may21_e.htm) and progress toward the Sustainable Development Goals will be derailed. While trade alone cannot eradicate vaccine unequity or its negative consequences for the [economy](https://news.un.org/en/story/2021/05/1091732) and [vulnerable groups](https://observatoryihr.org/news/covid-19-vaccine-distribution-highlights-social-inequality/), it has a powerful contribution to make. Here are four actions that would make an impact:

1. Increase COVAX support

Vaccine equity can only be achieved if the global community eschews vaccine nationalism. High-resource countries should [ramp up donations](https://www.devex.com/news/wto-chief-to-g-20-donate-2-3b-more-covid-19-vaccine-doses-100306) through the vaccine-sharing initiative COVAX and commit to securing a swift, workable resolution to ongoing debates around [technology transfers and intellectual property waivers](https://www.devex.com/news/wto-council-offers-hope-for-trips-vaccine-proposal-100125). While countries in the G-7 group of nations have [pledged to increase their support](https://www.who.int/news/item/13-06-2021-g7-announces-pledges-of-870-million-covid-19-vaccine-doses-of-which-at-least-half-to-be-delivered-by-the-end-of-2021) for COVAX, the initiative has faced hurdles in the form of [supply bottlenecks](https://www.devex.com/news/india-crisis-puts-covax-150-million-doses-behind-schedule-99860), [export restrictions](https://unctad.org/news/export-restrictions-do-not-help-fight-covid-19), and [logistical weaknesses](https://www.devex.com/news/the-cold-chain-storage-challenge-99869). Many currently available COVID-19 vaccines have short shelf lives and must be stored at low temperatures. LDCs can only benefit from donated doses if they have fast and efficient processing at their borders, modern transportation systems, and access to cold chain infrastructure.

2. Prioritize trade facilitation

Accelerating implementation of the [World Trade Organization](https://www.devex.com/organizations/world-trade-organization-wto-44694)’s 2017 [Trade Facilitation Agreement](https://www.wto.org/english/tratop_e/tradfa_e/tradfa_e.htm) is critical for helping LDCs overcome these challenges. A total of [154 WTO members](https://www.tfafacility.org/ratifications) now support the agreement, which pledges investment in the simplification and modernization of the movement, release, and customs clearance of goods globally. It also aims to help low-income countries overcome these same barriers through technical assistance and capacity building. The [Global Alliance for Trade Facilitation](https://www.devex.com/organizations/global-alliance-for-trade-facilitation-102992) has made good progress in identifying barriers to vaccine equity and introducing solutions. In [Mozambique](https://www.tradefacilitation.org/article/two-new-mozambique-projects-aim-to-ease-access-to-vaccines-medical-products/), for example, the alliance is working to digitalize pre-shipment authorization for vaccine imports — a process that can take as long as two weeks, during which vaccine doses must be kept in storage. This digitalization should help Mozambique decrease wait times, improve shipment traceability, and reduce storage and inventory management costs. Yet more work remains to help governments overcome [challenges associated with implementing](https://www.wto-ilibrary.org/trade-facilitation-and-customs-valuation/world-trade-report-2015_f2985d96-en) the Trade Facilitation Agreement, such as changing domestic legislation and involving the private sector. Lower-income countries and LDCs have flagged a need around human resources and training, legal assistance, and the acquisition of information and communication technologies.

3. Commit to Aid for Trade

For LDCs to participate fairly in global vaccine supply chains — as importers or exporters of inputs and finished products — they need financial and technical assistance to strengthen their [productive capacity](https://www.devex.com/news/cepi-ceo-concerted-effort-needed-to-build-lmic-vaccine-manufacturing-100013), streamline their cross-border standards and processes, and improve their logistics infrastructure and [technological know-how](https://www.wto.org/english/news_e/news21_e/dgno_21may21_e.htm). The Aid for Trade initiative exists to provide that support — but can only deliver if donor countries maintain or increase their official development assistance, or ODA. Preliminary figures from the [Organisation for Economic Co-operation and Development](https://www.devex.com/organizations/organisation-for-economic-co-operation-and-development-oecd-29872) show that [Development Assistance Committee](https://www.devex.com/organizations/development-assistance-committee-dac-100607) members [expanded their ODA by $10 billion](https://www.devex.com/news/what-to-make-of-the-2020-dac-stats-99641) between 2019 and 2020, mostly as part of their COVID-19 response. However, with several government donors having reprogrammed their aid budgets to focus on immediate health priorities, [fears are growing](https://www.weforum.org/agenda/2021/01/helping-small-businesses-build-resilience/) that their overall ODA may also be slashed — and, with this, their support for Aid for Trade. The generosity of some countries provides hope. Norway, for example, recently stepped up to help plug such gaps with [45 million Norwegian kroner](https://www.wto.org/english/news_e/news21_e/if_22jun21_e.htm) of additional funding for the WTO-backed [Enhanced Integrated Framework](https://www.devex.com/organizations/enhanced-integrated-framework-eif-78046), a global Aid for Trade program that aims to reduce poverty.

4. Invest in preparedness

In 2019, only [$374 million](http://www.healthdata.org/sites/default/files/files/policy_report/FGH/2020/FGH_2019_Interior_Final_Online_2020.09.18.pdf) — or less than 1% — of the world’s total development assistance for health was spent on pandemic preparedness. Within months, the consequences of that underinvestment became clear. Integrating lower-income countries and LDCs into global and regional [pharmaceutical value chains](https://unctad.org/news/unctad-report-says-least-developed-countries-position-improve-access-medicines-through-local-0) is vital for ensuring the world is better prepared next time. Directing increased aid to help these countries become [producers and exporters](https://www.bloomberg.com/news/articles/2021-07-26/africa-must-build-vaccine-production-capacity-wto-chief-says) of medical equipment and vaccines has never been more needed. LDCs would not only receive more of the [vaccines and therapeutics they need now](https://trade4devnews.enhancedif.org/en/op-ed/access-denied-ensuring-vaccines-worlds-poorest-countries) but could actively contribute to the global response when the next pandemic inevitably hits.

#### A waiver for Covid takes too long---only the CP solves. Fabricius 6/25

Peter Fabricius [institute for security services consultant], 6/20 - ("South Africa: Is Ramaphosa Tripping Over a TRIPS Waiver?," allAfrica, 6/25/2021, accessed 6-30-2021, https://allafrica.com/stories/202106260001.html)//ML

His fervour is prompting some suspicion that the waiver campaign is an ideological issue for South Africa and others on the left - who have always been suspicious of big pharma - rather than an objective solution to a crisis. That's because a TRIPS waiver cannot possibly rescue Africa from the immediate grips of the pandemic.¶ Even the mRNA project in South Africa would take at least around 12 months before manufacture can begin, WHO Chief Scientist Soumya Swaminathan said. And this would be with voluntary licensing and full technological cooperation and training from the patents' owners. Manufacturing vaccines from scratch and without that cooperation through a TRIPS waiver would take much longer.¶ The only immediate remedy is a vigorous campaign to pressure rich countries to donate vaccines¶ Yogesh Pai, Assistant Professor at the National Law University in Delhi, said the TRIPS waiver proposal was 'simplistic' in assuming that allowing the formulae of companies making vaccines to be copied would automatically enable other manufacturers to produce COVID-19 vaccines quickly.¶ Pai said most complex technologies, such as vaccines, comprised not only the knowledge, which is patented to prevent copying. It also involved undisclosed information and know-how about quality control measures for production and clinical data required for regulatory clearances.¶ An intellectual property waiver wouldn't give another company access to this deeper level of know-how. Only a cooperative agreement in which the technology owner helped the new manufacturer produce the vaccines could do this, Pai suggested.¶ Prashant Yadav, an expert on medical supply chains at Harvard Medical School, told ISS Today that it would probably take two to three years to produce a vaccine via a TRIPS waiver. First, the waiver would need to be secured, and then the necessary processes worked out without the help of the original developer.¶ Can Africa wait that long? At the launch of the mRNA project this week, Michael Ryan, Head of the WHO's Health Emergencies Programme, stressed that manufacturing COVID-19 vaccines in Africa, while commendable, wouldn't address the immediate crisis. The only solution was for rich countries to stop hoarding vaccines immediately. 'It will be a catastrophic moral failure at global level if we do not do that,' Ryan warned.¶ Yadav says the urgent strategy should be reallocating doses purchased by countries that don't need them and expanding vaccine production through voluntary licensing and tech transfer from the originator companies.¶ Of course, Ramaphosa could be right in suspecting that rich countries aren't altruistic enough to donate their 'surplus' vaccines, and so Africa and the rest of the global south must become more self-reliant.

#### And it competes off the net benefit: the perm wouldn’t solve because it would still link to the Innovation DA.

## Innovation DA

#### The pharma industry is strong now but patents are key for continued economic growth. Batell and PhRMA 14:

Batell and PhRMA {Battelle is the world’s largest nonprofit independent research and development organization, providing innovative solutions to the world’s most pressing needs through its four global businesses: Laboratory Management, National Security, Energy, Environment and Material Sciences, and Health and Life Sciences. The Pharmaceutical Research and Manufacturers of America (PhRMA) represents the country’s leading pharmaceutical research and biotechnology companies, which are devoted to inventing medicines that allow patients to live longer, healthier, and more productive lives.}, 14 – “The U.S. Biopharmaceutical Industry: Perspectives on Future Growth and The Factors That Will Drive It,” http://phrma-docs.phrma.org/sites/default/files/pdf/2014-economic-futures-report.pdf//marlborough-wr//

Compared to other capital-intensive, advanced manufacturing industries in the U.S., the biopharmaceutical industry is a leader in R&D investment, IP generation, venture capital investment, and R&D employment. Policies and infrastructure that helped foster these innovative activities have allowed the U.S. to seize global leadership in biopharmaceutical R&D over the past 30 years. However, as this report details, other countries are seeking to compete with the U.S. by borrowing and building upon some of these pro-innovation policies to improve their own operating environment and become more favorable to biopharmaceutical companies making decisions about where to locate their R&D and manufacturing activities. A unique contribution of this report was the inclusion of the perspective of senior-level strategic planning executives of biopharmaceutical companies regarding what policy areas they see as most likely to impact the favorability of the U.S. business operating environment. The executives cited the following factors as having the most impact on the favorability of the operating environment and hence, potential growth of the innovative biopharmaceutical industry in the U.S.: • Coverage and payment policies that support and encourage medical innovation • A well-functioning, science-based regulatory system • Strong IP protection and enforcement in the U.S. and abroad The top sub-attribute identified as driving future biopharmaceutical industry growth in the U.S. cited by executives was a domestic IP system that provides adequate patent rights and data protection. Collectively, these factors underscore the need to reduce uncertainties and ensure adequate incentives for the lengthy, costly, and risky R&D investments necessary to develop new treatments needed by patients and society to address our most costly and challenging diseases. With more than 300,000 jobs at stake between the two scenarios, the continued growth and leadership of the U.S. innovative biopharmaceutical industry cannot be taken for granted. Continued innovation is fundamental to U.S. economic well-being and the nation’s ability to compete effectively in a globalized economy and to take advantage of the expected growth in demand for new medicines around the world. Just as other countries have drawn lessons from the growth of the U.S. biopharmaceutical sector, the U.S. needs to assess how it can improve the environment for innovation and continue to boost job creation by increasing R&D investment, fostering a robust talent pool, enhancing economic growth and sustainability, and continuing to bring new medicines to patients.

#### COVID has kept patents and innovation strong, but continued protection is key to innovation by incentivizing biomedical research – it’s also crucial to preventing counterfeit medicines, economic collapse, and fatal diseases, which independently turns case. Macdole and Ezell 4-29:

Jaci Mcdole and Stephen Ezell {Jaci McDole is a senior policy analyst covering intellectual property (IP) and innovation policy at the Information Technology and Innovation Foundation (ITIF). She focuses on IP and its correlations to global innovation and trade. McDole holds a double BA in Music Business and Radio-Television with a minor in Marketing, an MS in Education, and a JD with a specialization in intellectual property (Southern Illinois University Carbondale). McDole comes to ITIF from the Institute for Intellectual Property Research, an organization she co-founded to study and further robust global IP policies. Stephen Ezell is vice president, global innovation policy, at the Information Technology and Innovation Foundation (ITIF). He comes to ITIF from Peer Insight, an innovation research and consulting firm he cofounded in 2003 to study the practice of innovation in service industries. At Peer Insight, Ezell led the Global Service Innovation Consortium, published multiple research papers on service innovation, and researched national service innovation policies being implemented by governments worldwide. Prior to forming Peer Insight, Ezell worked in the New Service Development group at the NASDAQ Stock Market, where he spearheaded the creation of the NASDAQ Market Intelligence Desk and the NASDAQ Corporate Services Network, services for NASDAQ-listed corporations. Previously, Ezell cofounded two successful innovation ventures, the high-tech services firm Brivo Systems and Lynx Capital, a boutique investment bank. Ezell holds a B.S. from the School of Foreign Service at Georgetown University, with an honors certificate from Georgetown’s Landegger International Business Diplomacy program.}, 21 - ("Ten Ways Ip Has Enabled Innovations That Have Helped Sustain The World Through The Pandemic," Information Technology & Innovation Foundation, 4-29-2021, https://itif.org/publications/2021/04/29/ten-ways-ip-has-enabled-innovations-have-helped-sustain-world-through)//marlborough-wr/

To better understand the role of IP in enabling solutions related to COVID-19 challenges, this report relies on 10 case studies drawn from a variety of nations, technical fields, and firm sizes. This is but a handful of the thousands of IP-enabled innovations that have sprung forth over the past year in an effort to meet the tremendous challenges brought on by COVID-19 globally. From a paramedic in Mexico to a veteran vaccine manufacturing company in India and a tech start-up in Estonia to a U.S.-based company offering workplace Internet of Things (IoT) services, small and large organizations alike are working to combat the pandemic. Some have adapted existing innovations, while others have developed novel solutions. All are working to take the world out of the pandemic and into the future. The case studies are: Bharat Biotech: Covaxin Gilead: Remdesivir LumiraDX: SARS-COV-2 Antigen POC Test Teal Bio: Teal Bio Respirator XE Ingeniería Médica: CápsulaXE Surgical Theater: Precision VR Tombot: Jennie Starship Technologies: Autonomous Delivery Robots Triax Technologies: Proximity Trace Zoom: Video Conferencing As the case studies show, IP is critical to enabling innovation. Policymakers around the world need to ensure robust IP protections are—and remain—in place if they wish their citizens to have safe and innovative solutions to health care, workplace, and societal challenges in the future. THE ROLE OF INTELLECTUAL PROPERTY IN R&D-INTENSIVE INDUSTRIES Intangible assets, such as IP rights, comprised approximately 84 percent of the corporate value of S&P 500 companies in 2018.4 For start-ups, this means much of the capital needed to operate is directly related to IP (see Teal Bio case study for more on this). IP also plays an especially important role for R&D-intensive industries.5 To take the example of the biopharmaceutical industry, it is characterized by high-risk, time-consuming, and expensive processes including basic research, drug discovery, pre-clinical trials, three stages of human clinical trials, regulatory review, and post-approval research and safety monitoring. The drug development process spans an average of 11.5 to 15 years.6 For every 5,000 to 10,000 compounds screened on average during the basic research and drug discovery phases, approximately 250 molecular compounds, or 2.5 to 5 percent, make it to preclinical testing. Out of those 250 molecular compounds, approximately 5 make it to clinical testing. That is, 0.05 to 0.1 percent of drugs make it from basic research into clinical trials. Of those rare few which make it to clinical testing, less than 12 percent are ultimately approved for use by the U.S. Food and Drug Administration (FDA).7 In addition to high risks, drug development is costly, and the expenses associated with it are increasing. A 2019 report by the Deloitte Center for Health Solutions concluded that since 2010 the average cost of bringing a new drug to market increased by 67 percent.8 Numerous studies have examined the substantial cost of biopharmaceutical R&D, and most confirm investing in new drug development requires $1.7 billion to $3.2 billion up front on average.9 A 2018 study by the Coalition for Epidemic Preparedness found similar risks and figures for vaccines, stating, “In general, vaccine development from discovery to licensure can cost billions of dollars, can take over 10 years to complete, and has an average 94 percent chance of failure.”10 Yet, a 2010 study found that 80 percent of new drugs—that is, the less than 12 percent ultimately approved by the FDA—made less than their capitalized R&D costs.11 Another study found that only 1 percent (maybe three new drugs each year) of the most successful 10 percent of FDA approved drugs generate half of the profits of the entire drug industry.12 To say the least, biopharmaceutical R&D represents a high-stakes, long-term endeavor with precarious returns. Without IP protection, biopharmaceutical manufacturers have little incentive to take the risks necessary to engage in the R&D process because they would be unable to recoup even a fraction of the costs incurred. Diminished revenues also result in reduced investments in R&D which means less research into cancer drugs, Alzheimer cures, vaccines, and more. IP rights give life-sciences enterprises the confidence needed to undertake the difficult, risky, and expensive process of life-sciences innovation secure in the knowledge they can capture a share of the gains from their innovations, which is indispensable not only to recouping the up-front R&D costs of a given drug, but which can generate sufficient profits to enable investment in future generations of biomedical innovation and thus perpetuate the enterprises into the future.13 THE IMPORTANCE OF INTELLECTUAL PROPERTY TO INNOVATION Although anti-IP proponents have attacked biopharmaceutical manufacturers particularly hard, the reality is all IP-protected innovations are at risk if these rights are ignored, or vitiated. Certain arguments have shown a desire for the term “COVID-19 innovations” to include everything from vaccines, therapeutics, diagnostics, and PPE to biotechnology, AI-related data, and educational materials.14 This could potentially open the floodgates to invalidate IP protection on many of the innovations

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highlighted in this report. However, much of the current discussion concerning IP focuses almost entirely on litigation fears or R&D incentives. Although R&D is an important aspect of IP, as previously mentioned, these discussions ignore the fact that IP protection can be—and often is—used for other purposes, including generating initial capital to create a company and begin manufacturing and, more importantly, using licensing agreements and IP to track the supply chain and ensure quality control of products. This report highlights but a handful of the thousands of IP-enabled innovations that have sprung forth over the past year in an effort to meet the tremendous challenges brought on by COVID-19 globally. In 2018, Forbes identified counterfeiting as the largest criminal enterprise in the world.15 The global struggle against counterfeit and non-regulated products, which has hit Latin America particularly hard during the pandemic, proves the need for safety and quality assurance in supply chains.16 Some communities already ravaged by COVID-19 are seeing higher mortality rates related to counterfeit vaccines, therapeutics, PPE, and cleaning and sanitizing products.17 Polish authorities discovered vials of antiwrinkle treatment labeled as COVID-19 vaccines. 18 In Mexico, fake vaccines sold for approximately $1,000 per dose.19 Chinese and South African police seized thousands of counterfeit vaccine doses from warehouses and manufacturing plants.20 Meanwhile, dozens of websites worldwide claiming to sell vaccines or be affiliated with vaccine manufacturers have been taken down.21 But the problem is not limited to biopharmaceuticals. The National Intellectual Property Rights Coordination Center has recovered $48 million worth of counterfeit PPE and other products.22 Collaborative efforts between law enforcement and manufacturers have kept numerous counterfeits from reaching the population. In countries with strong IP protection, the chances of counterfeit products reaching the market are significantly lower. This is largely because counterfeiting tends to be an IP-related issue, and these countries generally provide superior means of tracking the supply chain through trademarks, trade secrets, and licensing agreements. This enables greater quality control and helps manufacturers maintain a level of public confidence in their products. By controlling the flow of knowledge associated with IP, voluntary licensing agreements provide innovators with opportunities to collaborate, while ensuring their partners are properly equipped and capable of producing quality products. Throughout this difficult time, the world has seen unexpected collaborations, especially between biopharmaceutical companies worldwide such as Gilead and Eva Pharma or Bharat Biotech and Ocugen, Inc. Throughout history, and most significantly in the nineteenth century through the widespread development of patent systems and the ensuing Industrial Revolution, IP has contributed toward greater economic growth.23 This is promising news as the world struggles for economic recovery. A 2021 joint study by the EU Intellectual Property Office (EUIPO) and European Patent Office (EPO) shows a strong, positive correlation between IP rights and economic performance.24 It states that “IP-owning firms represent a significantly larger proportion of economic activity and employment across Europe,” with IP-intensive industries contributing to 45 percent of gross domestic product (GDP) (€6.6 trillion; US$7.9 trillion).25 The study also shows 38.9 percent of employment is directly or indirectly attributed to IP-intensive industries, and IP generates higher wages and greater revenue per employee, especially for small-to-medium-sized enterprises.26 That concords with the United States, where the Department of Commerce estimated that IP-intensive industries support at least 45 million jobs and contribute more than $6 trillion dollars to, or 38.2 percent of, GDP.27 In 2020, global patent filings through the World Intellectual Property Organization’s (WIPO) Patent Cooperation Treaty (PCT) system reached a record 275,900 filings amidst the pandemic, growing 4 percent from 2019.28 The top-four nations, which accounted for 180,530 of the patent applications, were China, the United States, Japan, and Korea, respectively.29 While several countries saw an increase in patent filings, Saudi Arabia and Malaysia both saw significant increases in the number of annual applications, with the top two filing growths of 73 percent and 26 percent, respectively.30 The COVID-19 pandemic slowed a lot of things, but it certainly couldn’t stop innovation. There are at least five principal benefits strong IP rights can generate, for both developing and developed countries alike.31 First, stronger IP protection spurs the virtuous cycle of innovation by increasing the appropriability of returns, enabling economic gain and catalyzing economic growth. Second, through patents—which require innovators to disclose certain knowledge as a condition of protection—knowledge spillovers build a platform of knowledge that enables other innovators. For instance, studies have found that the rate of return to society from corporate R&D and innovation activities is at least twice the estimated returns that each company itself receives.32 Third, countries with robust IP can operate more efficiently and productively by using IP to determine product quality and reduce transaction costs. Fourth, trade and foreign direct investment enabled and encouraged by strong IP protection offered to enterprises from foreign countries facilitates an accumulation of knowledge capital within the destination economy. That matters when foreign sources of technology account for over 90 percent of productivity growth in most countries.33 There’s also evidence suggesting that developing nations with stronger IP protections enjoy the earlier introduction of innovative new medicines.34 And fifth, strong IP boosts exports, including in developing countries.35 Research shows a positive correlation between stronger IP protection and exports from developing countries as well as faster growth rates of certain industries.36 The following case studies illustrate these benefits of IP and how they’ve enabled innovative solutions to help global society navigate the COVID-19 pandemic.

#### This sets a precedent that spills over to all future diseases – Hopkins 21:

Jared S. Hopkins {Jared S. Hopkins is a New York-based reporter for The Wall Street Journal covering the pharmaceutical industry, including companies such as Pfizer Inc. and Merck & Co. He previously was a health-care reporter at Bloomberg News and an investigative reporter at the Chicago Tribune. Jared started his career at The Times-News in Twin Falls, Idaho covering politics. In 2014, he was a finalist for the Livingston Award For Young Journalists for an investigation into charities founded by professional athletes. In 2011, he was a finalist for the Pulitzer Prize in Investigative Reporting for a series about neglect at a residential facility for disabled kids. Jared graduated from the Merrill College of Journalism at the University of Maryland-College Park with a bachelor's degree in journalism}, 21 - ("U.S. Support for Patent Waiver Unlikely to Cost Covid-19 Vaccine Makers in Short Term ," WSJ, 5-7-2021, https://www.wsj.com/articles/u-s-support-for-patent-waiver-unlikely-to-cost-covid-19-vaccine-makers-in-short-term-11620414260)//marlborough-wr/

The Biden administration’s unexpected support for [temporarily waiving Covid-19 vaccine patents](https://www.wsj.com/articles/u-s-backs-waiver-of-intellectual-property-protection-for-covid-19-vaccines-11620243518?mod=article_inline) won’t have an immediate financial impact on the companies making the shots, industry officials and analysts said. Yet the decision could mark a shift in Washington’s longstanding support of the industry’s valuable intellectual property, patent-law experts said. A waiver, if it does go into effect, may pose long-term risks to the vaccine makers, analysts said. [Moderna](https://www.wsj.com/market-data/quotes/MRNA) Inc., [MRNA -4.12%](https://www.wsj.com/market-data/quotes/MRNA?mod=chiclets) [Pfizer](https://www.wsj.com/market-data/quotes/PFE) Inc. [PFE -3.10%](https://www.wsj.com/market-data/quotes/PFE?mod=chiclets) and other vaccine makers weren’t counting on sales from the developing countries that would gain access to the vaccine technology, analysts said. If patents and other crucial product information behind the technology is made available, it would take at least several months before shots were produced, industry officials said. Yet long-term Covid-19 sales could take a hit if other companies and countries gained access to the technologies and figured out how to use it. Western drugmakers could also confront competition sooner for other medicines they are hoping to make using the technologies. A World Trade Organization waiver could also set a precedent for waiving patents for other medicines, a long-sought goal of some developing countries, patient groups and others to try to reduce the costs of prescription drugs. “It sets a tremendous precedent of waiving IP rights that’s likely going to come up in future pandemics or in other serious diseases,” said David Silverstein, a patent lawyer at Axinn, Veltrop & Harkrider LLP who advises drugmakers. “Other than that, this is largely symbolic.”

#### Pharmaceutical innovation is key to protecting against future pandemics, bioterrorism, and antibiotic resistance.

Marjanovic and Fejiao ‘20 Marjanovic, Sonja, and Carolina Feijao. Sonja Marjanovic, Ph.D., Judge Business School, University of Cambridge. Carolina Feijao, Ph.D. in biochemistry, University of Cambridge; M.Sc. in quantitive biology, Imperial College London; B.Sc. in biology, University of Lisbon. "Pharmaceutical Innovation for Infectious Disease Management: From Troubleshooting to Sustainable Models of Engagement." (2020). [Quality Control]

As key actors in the healthcare innovation landscape, pharmaceutical and life sci-ences companies have been called on to develop medicines, vaccines and diagnostics for pressing public health challenges. The COVID-19 crisis is one such challenge, but there are many others. For example, MERS, SARS, Ebola, Zika and avian and swine flu are also infectious diseases that represent public health threats. Infectious agents such as anthrax, smallpox and tularemia could present threats in a **bioterrorism con-text**.1 The general threat to public health that is posed by **antimicrobial resistance** is also **well-recognised** as an area **in need of pharmaceutical innovation**. Innovating in response to these challenges does not always align well with pharmaceutical industry commercial models, shareholder expectations and compe-tition within the industry. However, the expertise, networks and infrastructure that industry has within its reach, as well as public expectations and the moral imperative, make pharmaceutical companies and the wider life sciences sector an **indispensable** partner in the search for solutions that save lives. This perspective argues for the need to establish more sustainable and scalable ways of incentivising pharmaceu-tical innovation

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in response to infectious disease threats to public health. It considers both past and current examples of efforts to mobilise pharmaceutical innovation in high commercial risk areas, including in the context of current efforts to respond to the COVID-19 pandemic. In global pandemic crises like COVID-19, the urgency and scale of the crisis – as well as the spotlight placed on pharmaceutical companies – mean that contributing to the search for effective medicines, vaccines or diagnostics is **essential** for socially responsible companies in the sec-tor.2 It is therefore unsurprising that we are seeing indus-try-wide efforts unfold at unprecedented scale and pace. Whereas there is always scope for more activity, industry is currently contributing in a variety of ways. Examples include pharmaceutical companies donating existing com-pounds to assess their utility in the fight against COVID-19; screening existing compound libraries in-house or with partners to see if they can be repurposed; accelerating tri-als for potentially effective medicine or vaccine candidates; and in some cases rapidly accelerating in-house research and development to discover new treatments or vaccine agents and develop diagnostics tests.3,4 Pharmaceutical companies are collaborating with each other in some of these efforts and participating in global R&D partnerships (such as the Innovative Medicines Initiative effort to accel-erate the development of potential therapies for COVID-19) and supporting national efforts to expand diagnosis and testing capacity and ensure affordable and ready access to potential solutions.3,5,6 The primary purpose of such innovation is to **benefit patients** and wider **population health**. Although there are also reputational benefits from involvement that can be realised across the industry, there are likely to be rela-tively few companies that are ‘commercial’ winners. Those who might gain substantial revenues will be under pres-sure not to be seen as profiting from the pandemic. In the United Kingdom for example, GSK has stated that it does not expect to profit from its COVID-19 related activities and that any gains will be invested in supporting research and long-term pandemic preparedness, as well as in developing products that would be affordable in the world’s poorest countries.7 Similarly, in the United States AbbVie has waived intellectual property rights for an existing com-bination product that is being tested for therapeutic poten-tial against COVID-19, which would support affordability and allow for a supply of generics.8,9 Johnson & Johnson has stated that its potential vaccine – which is expected to begin trials – will be available on a not-for-profit basis during the pandemic.10 Pharma is mobilising substantial efforts to rise to the COVID-19 challenge at hand. However, we need to consider how pharmaceutical innovation for responding to emerging infectious diseases can best be enabled beyond the current crisis. Many public health threats (including those associated with other **infectious diseases**, **bioterror-ism** agents **and antimicrobial resistance**) are **urgently in need of pharmaceutical innovation**, **even if their impacts are not as visible** to society **as COVID**-19 is in the imme-diate term. The pharmaceutical industry has responded to previous public health emergencies associated with infec-tious disease in recent times – for example those associated with Ebola and Zika outbreaks.11 However, it has done so to a lesser scale than for COVID-19 and with contribu-tions from fewer companies. Similarly, levels of activity in response to the threat of antimicrobial resistance are still **low**.12 There are important policy questions as to whether – and how – industry could engage with such public health threats to an even greater extent under improved innova-tion conditions.

#### Bioterror causes extinction---quick innovation key

Farmer 17 (“Bioterrorism could kill more people than nuclear war, Bill Gates to warn world leaders” http://www.telegraph.co.uk/news/2017/02/17/biological-terrorism-could-kill-people-nuclear-attacks-bill/)

Bioterrorists could one day kill hundreds of millions of people in an attack more deadly than nuclear war, Bill Gates will warn world leaders. Rapid advances in genetic engineering have opened the door for small terrorism groups to tailor and easily turn biological viruses into weapons. A resulting disease pandemic is currently one of the most deadly threats faced by the world, he believes, yet governments are complacent about the scale of the risk. Speaking ahead of an address to the Munich Security Conference, the richest man in the world said that while governments are concerned with the proliferation of nuclear and chemical weapons, they are overlooking the threat of biological warfare. Mr Gates, whose charitable foundationis funding research into quickly spotting outbreaks and speeding up vaccine production, said the defence and security establishment “have not been following biology and I’m here to bring them a little bit of bad news”. Mr Gates will today (Saturday) tell an audience of international leaders and senior officers that the world’s next deadly pandemic “could originate on the computer screen of a terrorist”. He told the Telegraph: “Natural epidemics can be extremely large. Intentionally caused epidemics, bioterrorism, would be the largest of all. “With nuclear weapons, you’d think you would probably stop after killing 100million. Smallpox won’t stop. Because the population is naïve, and there are no real preparations. That, if it got out and spread, would be a larger number.” He said developments in genetic engineering were proceeding at a “mind-blowing rate”. Biological warfare ambitions once limited to a handful of nation states are now open to small groups with limited resources and skills. He said: “They make it much easier for a non-state person. It doesn’t take much biology expertise nowadays to assemble a smallpox virus. Biology is making it way easier to create these things.” The increasingly common use of gene editing technology would make it difficult to spot any potential terrorist conspiracy. Technologies which have made it easy to read DNA sequences and tinker with them to rewrite or tweak genes have many legitimate uses. He said: “It’s not like when someone says, ‘Hey I’d like some Plutonium’ and you start saying ‘Hmmm.. I wonder why he wants Plutonium?’” Mr Gates said the potential death toll from a disease outbreak could be higher than other threats such as climate change or nuclear war. He said: “This is like earthquakes, you should think in order of magnitudes. If you can kill 10 people that’s a one, 100 people that’s a two... Bioterrorism is the thing that can give you not just sixes, but sevens, eights and nines. “With nuclear war, once you have got a six, or a seven, or eight, you’d think it would probably stop. [With bioterrorism] it’s just unbounded if you are not there to stop the spread of it.” By tailoring the genes of a virus, it would be possible to manipulate its ability to spread and its ability to harm people. Mr Gates said one of the most potentially deadly outbreaks could involve the humble flu virus. It would be relatively easy to engineer a new flu strain combining qualities from varieties that spread like wildfire with varieties that were deadly. The last time that happened naturally was the 1918 Spanish Influenza pandemic, which went on to kill more than 50 million people – or nearly three times the death toll from the First World War. By comparison, the recent Ebola outbreak in West Africa which killed just over 11,000 was “a Richter Scale three, it’s a nothing,” he said. But despite the potential, the founder of Microsoft said that world leaders and their militaries could not see beyond the more recognised risks. He said: “Should the world be serious about this? It is somewhat serious about normal classic warfare and nuclear warfare, but today it is not very serious about bio-defence or natural epidemics.” He went on: “They do tend to say ‘How easy is it to get fissile material and how accurate are the plans out on the internet for dirty bombs, plutonium bombs and hydrogen bombs?’ “They have some people that do that. What I am suggesting is that the number of people that look at bio-defence is worth increasing.” Whether naturally occurring, or deliberately started, it is almost certain that a highly lethal global pandemic will occur within our lifetimes, he believes. But the good news for those contemplating the potential damage is that the same biotechnology can prevent epidemics spreading out of control. Mr Gates will say in his speech that most of the things needed to protect against a naturally occurring pandemic are the same things needed to prepare for an intentional biological attack. Nations must amass an arsenal of new weapons to fight such a disease outbreak, including vaccines, drugs and diagnostic techniques. Being able to develop a vaccine as soon as possible against a new outbreak is particularly important and could save huge numbers of lives, scientists working at his foundation believe.

## Politics DA

**Biden not pushingthe waiver**

**Ramachandran, 8-21**, 21, Reshma Ramachandran is a family medicine physician and fellow at the National Clinician Scholars Program at Yale University. She sits on the board of the non-profit organization Universities Allied for Essential Medicines North America, and is a member of the People's Vaccine Alliance and co-host of the Free The Vaccine campaign. Asia Russell is the Executive Director of the non-profit Health GAP, a member of the People's Vaccine Alliance and partner organization of the Free The Vaccine campaign, CNN, Biden's failing global Covid-19 response, https://www.cnn.com/2021/08/21/opinions/biden-global-covid-response-ramachandran-russell/index.html

Reallocating excess doses and relying on pharmaceutical companies looking to profit off the prolongation of the pandemic that has driven demand for additional booster doses will not be enough to end this crisis. **Despite his promise to support an IP waiver for Covid-19 vaccines, Biden has done seemingly little to encourage his counterparts in other wealthy nations including the European Union and United Kingdom to do the same**; instead, these nations have continued to obstruct the waiver at the World Trade Organization (WTO). Going beyond a single statement of support, President Biden should champion this proposal and leverage his strong personal connections with allies to ensure its prompt passage and enactment at the WTO.

**Biden going weak on IPR burns capital and trades-off with other agenda items. Arun 21:**

TK Arun, April 15, 2021, Economic times, View: With the US sitting on a pile of vaccines, Biden needs to change tack on policy that harms the world, https://economictimes.indiatimes.com/news/economy/foreign-trade/view-with-the-us-sitting-on-a-pile-of-vaccines-biden-needs-to-changes-tack-on-policy-that-harms-the-world/articleshow/82058647.cms?from=mdr

So, what **can Biden** do, to scale up vaccine production? Remove export restrictions. Buy out the intellectual property rights (IPRs) of successful vaccine candidates, strip vaccine know-how of patents and royalties**,** and make it available as a global public good. This is tactically superior to waiving IPR at the World Trade Organisation (WTO) for Biden, as the **Republicans have already started a campaign against such threats to capitalism and Biden needs all the political capital he has to push his American Jobs Plan through the Senate.**

#### The infrastructure and budget bills are on the knife’s edge to pass.

Grandoni & Dennis 8/11 - Dino Grandoni and Brady Dennis [Environment reporters], “Biden aims for sweeping climate action as infrastructure, budget bills advance,” *Washington Post* (Web). 8/11/21. Accessed 9/15/21. <https://www.washingtonpost.com/climate-environment/2021/08/10/biden-climate-congress/> AT

The Senate approved on Tuesday a sweeping bipartisan $1.2 trillion infrastructure bill with funding for many public works meant to cut climate-warning emissions. A day later, Democrats in the chamber took a major step to adopt an even bigger, $3.5 trillion budget bill supporting yet more programs for cleaning up power plants and cars.¶ Each, if passed, would invest billions of dollars in the sort of clean energy transition the United States must make to have any chance of hitting the goal set by President Biden to cut the nation’s emissions by at least 50 percent by the end of this decade.¶ “This was one of the most significant legislative days we’ve had in a long time here,” Senate Majority Leader Charles E. Schumer (D-N.Y.) told reporters Wednesday.¶ But both bills face a potentially bumpy road ahead. Democrats still need to draft in committees the details of their massive budget reconciliation package over the coming weeks, with not a single vote to spare in the 50-50 split Senate. The bipartisan public-works bill, meanwhile, still needs approval from the House, where progressive Democrats hold significant sway.¶ The moves on Capitol Hill come as hundreds of scientists detailed this week the intensifying fires, floods and other catastrophes that will continue to worsen until humans dramatically scale back greenhouse gas emissions.¶ Scientists assembled by the United Nations made clear in a landmark report Monday that time is running out for the world to make immediate and dramatic cuts to emissions produced by the burning of fossil fuels and other human activities. U.N. Secretary General António Guterres called the sobering, sprawling report from the Intergovernmental Panel on Climate Change a “code red for humanity.”

#### Infrastructure solves the grid – it’s vulnerable now and requires investment

Gozdziewski 3/22 - Charles J. Gozdziewski is the American Council of Engineering Companies' (ACEC) Board Chair. He is also the Chairman Emeritus of Hardesty & Hanover in New York where he oversees transportation planning, construction inspection and support services for highways; all types of movable, fixed and railroad bridges; as well as special structures. 2021 (“Our nation's critical infrastructure is dangerously vulnerable”, available online at <https://thehill.com/changing-america/opinion/544330-our-nations-critical-infrastructure-is-dangerously-vulnerable?amp>, Changing America is a subsidiary of the Hill)

The recent historic snowfall in Texas and the ensuing failure of the state's power grid have laid bare what we in the engineering industry have known for a long time - our nation's critical infrastructure is dangerously vulnerable to a wide range of threats. We must act quickly and comprehensively to make our infrastructure more resilient because those threats will only become more severe in the future.

While the focus right now is justifiably on the energy sector and the power grid, all of our nation's infrastructure systems - transportation, water, and power - are at risk from extreme weather. Climate change lies at the heart of this challenge, and to mitigate its effects, we must have robust investment to fund the design and construction of the resilient infrastructure our country needs.

As engineers, infrastructure is who we are. It is critically entwined in everything we do - from embracing smart cities, to establishing safe protocols in buildings for a post-COVID world, to preparing for the much needed Fourth Industrial Revolution. The need for resilience, sustainability, reliability, and flexibility will become even more vital as we move into the future.

As leaders in the engineering and design industry, we have both a stake in and a valuable perspective on the policy discussion on infrastructure. Moreover, we are a critical partner in the implementation of that policy and the repair and upgrading of all aspects of our physical infrastructure - including roads, bridges, freight rail, ports, electrical grids, and Internet provision. Each of these components is critical to the health of our physical and built environment.

Yet our expertise is worth nothing if the public sector clients we serve lack certainty from the federal government that there will be consistent, predictive funding in place to finance the infrastructure improvements we need. No designs will be drawn up and no dirt will be moved. It is imperative that our federal lawmakers act on a transformative infrastructure plan before the current law expires in September.

Investing now in a long-term infrastructure bill will pay dividends, not only to mitigate the effects of a changing climate, but to help our nation recover from the COVID-19 pandemic. Engineers play a substantial role in the health of the national economy. According to the ACEC Research Institute's Industry Impact Series of reports, the Engineering and Design Services sector currently employs 1.5 million Americans directly. Those employees and their companies collectively support another 3 million jobs in the various contracting and other firms with which they work. The Institute's latest study found that each new job created in the Engineering and Design Services industry indirectly creates two additional jobs in related sectors across the economy.

The data shows that investments in infrastructure that support engineering jobs pave the way for economic opportunity. What's more, the designs our industry creates help improve the built environment, making it more resilient to climate change. This is a win-win for society, creating a more equitable, environmentally sound, and prosperous built environment resulting in job creation and economic mobility. We look forward to working with policyholders, members of Congress, and the Biden-Harris Administration to develop sustainable solutions that benefit the country as a whole in the weeks ahead.

#### Loss of critical infrastructure causes extinction

Friedemann 16 (Alice Friedemann, transportation expert, founder of EnergySkeptic.com and author of “When Trucks Stop Running, Energy and the Future of Transportation,” worked at American Presidential Lines for 22 years, where she developed computer systems to coordinate the transit of cargo between ships, rail, trucks, and consumers, citing Dr. Peter Vincent Pry. Pry is executive director of the Task Force on National and Homeland Security, a Congressional advisory board dedicated to achieving protection of the United States from electromagnetic pulse and other threats. Dr. Pry is also the director of the United States Nuclear Strategy Forum, an advisory body to Congress on policies to counter weapons of mass destruction. Dr. Pry has served on the staffs of the Congressional Commission on the Strategic Posture of the United States, the Commission to Assess the Threat to the U.S. from an EMP Attack, the House Armed Services Committee, as an intelligence officer with the CIA, and as a verification analyst at the U.S. Arms Control and Disarmament Agency. 1-24-16, accessed 1/1/19 “Electromagnetic pulse threat to infrastructure (U.S. House hearings)” <http://energyskeptic.com/2016/the-scariest-u-s-house-session-ever-electromagnetic-pulse-and-the-fall-of-civilization/>)

Modern civilization cannot exist for a protracted period without electricity. Within days of a blackout across the U.S., a blackout that could encompass the entire planet, emergency generators would run out of fuel, telecommunications would cease as would transportation due to gridlock, and eventually no fuel. Cities would have no running water and soon, within a few days, exhaust their food supplies. Police, Fire, Emergency Services and hospitals cannot long operate in a blackout. Government and Industry also need electricity in order to operate. The EMP Commission warns that a natural or nuclear EMP event, given current unpreparedness, would likely result in societal collapse. Terrorists, criminals, and even lone individuals can build a non-nuclear EMP weapon without great trouble or expense, working from Unclassified designs publicly available on the internet, and using parts available at any electronics store. In 2000, the Terrorism Panel of the House Armed Services Committee sponsored an experiment, recruiting a small team of amateur electronics enthusiasts to attempt constructing a radiofrequency weapon, relying only on unclassified design information and parts purchased from Radio Shack. The team, in 1 year, built two radiofrequency weapons of radically different designs. One was designed to fit inside the shipping crate for a Xerox machine, so it could be delivered to the Pentagon mail room where (in those more unguarded days before 9/11) it could slowly fry the Pentagon’s computers. The other radiofrequency weapon was designed to fit inside a small Volkswagon bus, so it could be driven down Wall Street and disrupt computers— and perhaps the National economy. Both designs were demonstrated and tested successfully during a special Congressional hearing for this purpose at the U.S. Army’s Aberdeen Proving Ground. Radiofrequency weapons are not merely a hypothetical threat. Terrorists, criminals, and disgruntled individuals have used home-made radiofrequency weapons. The U.S. military and foreign militaries have a wide variety of such weaponry. Moreover, non-nuclear EMP devices that could be used as radiofrequency weapons are publicly marketed for sale to anyone, usually advertised as ‘‘EMP simulators.’’ For example, one such simulator is advertised for public sale as an ‘‘EMP Suitcase.’’ This EMP simulator is designed to look like a suitcase, can be carried and operated by one person, and is purpose-built with a high energy radiofrequency output to destroy electronics. However, it has only a short radius of effect. Nonetheless, a terrorist or deranged individual who knows what he is doing, who has studied the electric grid for a major metropolitan area, could—armed with the ‘‘EMP Suitcase’’— black out a major city. A CLEAR AND PRESENT DANGER. An EMP weapon can be used by state actors who wish to level the battlefield by neutralizing the great technological advantage enjoyed by U.S. military forces. EMP is also the ideal means, the only means, whereby rogue states or terrorists could use a single nuclear weapon to destroy the United States and prevail in the War on Terrorism or some other conflict with a single blow. The EMP Commission also warned that states or terrorists could exploit U.S. vulnerability to EMP attack for coercion or blackmail: ‘‘Therefore, terrorists or state actors that possess relatively unsophisticated missiles armed with nuclear weapons may well calculate that, instead of destroying a city or military base, they may obtain the greatest political-military utility from one or a few such weapons by using them—or threatening their use—in an EMP attack.’’ The EMP Commission found that states such as Russia, China, North Korea, and Iran have incorporated EMP attack into their military doctrines, and openly describe making EMP attacks against the United States. Indeed, the EMP Commission was established by Congress partly in response to a Russian nuclear EMP threat made to an official Congressional Delegation on May 2, 1999, in the midst of the Balkans crisis. Vladimir Lukin, head of the Russian delegation and a former Ambassador to the United States, warned: ‘‘Hypothetically, if Russia really wanted to hurt the United States in retaliation for NATO’s bombing of Yugoslavia, Russia could fire an SLBM and detonate a single nuclear warhead at high altitude over the United States. The resulting EMP would massively disrupt U.S. communications and computer systems, shutting down everything.’’ China’s military doctrine also openly describes EMP attack as the ultimate asymmetric weapon, as it strikes at the very technology that is the basis of U.S. power. Where EMP is concerned, ‘‘The United States is more vulnerable to attacks than any other country in the world’’: ‘‘Some people might think that things similar to the ‘Pearl Harbor Incident’ are unlikely to take place during the information age. Yet it could be regarded as the ‘Pearl Harbor Incident’ of the 21st Century if a surprise attack is conducted against the enemy’s crucial information systems of command, control, and communications by such means as… electromagnetic pulse weapons… Even a superpower like the United States, which possesses nuclear missiles and powerful armed forces, cannot guarantee its immunity…In their own words, a highly computerized open society like the United States is extremely vulnerable to electronic attacks from all sides. This is because the U.S. economy, from banks to telephone systems and from power plants to iron and steel works, relies entirely on computer networks… When a country grows increasingly powerful economically and technologically…it will become increasingly dependent on modern information systems… The United States is more vulnerable to attacks than any other country in the world.’’ Iran—the world’s leading sponsor of international terrorism—in military writings openly describes EMP as a terrorist weapon, and as the ultimate weapon for prevailing over the West: ‘‘If the world’s industrial countries fail to devise effective ways to defend themselves against dangerous electronic assaults, then they will disintegrate within a few years… American soldiers would not be able to find food to eat nor would they be able to fire a single shot.’’ The threats are not merely words. The EMP Commission assesses that Russia has, as it openly declares in military writings, probably developed what Russia describes as a ‘‘Super-EMP’’ nuclear weapon—specifically designed to generate extraordinarily high EMP fields in order to paralyze even the best protected U.S. strategic and military forces. China probably also has Super-EMP weapons. North Korea too may possess or be developing a Super-EMP nuclear weapon, as alleged by credible Russian sources to the EMP Commission, and by open-source reporting from South Korean military intelligence. But any nuclear weapon, even a low-yield first generation device, could suffice to make a catastrophic EMP attack on the United States. Iran, although it is assessed as not yet having the bomb, is actively testing missile delivery systems and has practiced launches of its best missile, the Shahab–III, fuzing for high- altitude detonations, in exercises that look suspiciously like training for making EMP attacks. As noted earlier, Iran has also practiced launching from a ship a Scud, the world’s most common missile—possessed by over 60 nations, terrorist groups, and private collectors. A Scud might be the ideal choice for a ship-launched EMP attack against the United States intended to be executed anonymously, to escape any last-gasp U.S. retaliation. Unlike a nuclear weapon detonated in a city, a high-altitude EMP attack leaves no bomb debris for forensic analysis, no perpetrator ‘‘fingerprints.’’ Under present levels of preparedness, communications would be severely limited, restricted mainly to those few military communications networks that are hardened against EMP. Today’s microelectronics are the foundation of our modern civilization, but are over 1 million times more vulnerable to EMP than the far more primitive and robust electronics of the 1960s, that proved vulnerable during nuclear EMP tests of that era. Tests conducted by the EMP Commission confirmed empirically the theory that, as modern microelectronics become ever smaller and more efficient, and operate ever faster on lower voltages, they also become ever more vulnerable, and can be destroyed or disrupted by much lower EMP field strengths. Microelectronics and electronic systems are everywhere, and run virtually everything in the modern world. All of the civilian critical infrastructures that sustain the economy of the United States, and the lives of 310 million Americans, depend, directly or indirectly, upon electricity and electronic systems. Of special concern is the vulnerability to EMP of the Extra-High-Voltage (EHV) transformers, that are indispensable to the operation of the electric grid. EHV transformers drive electric current over long distances, from the point of generation to consumers (from the Niagara Falls hydroelectric facility to New York City, for example). The electric grid cannot operate without EHV transformers—which could be destroyed by an EMP event. The United States no longer manufactures EHV transformers. They must be manufactured and imported from overseas, from Germany or South Korea, the only two nations in the world that manufacture such transformers for export. Each EHV transformer must be custom-made for its unique role in the grid. A single EHV transformer typically requires 18 months to manufacture. The loss of large numbers of EHV transformers to an EMP event would plunge the United States into a protracted blackout lasting years, with perhaps no hope of eventual recovery, as the society and population probably could not survive for even 1 year without electricity. Another key vulnerability to EMP are Supervisory Control And Data Acquisition systems (SCADAs). SCADAs essentially are small computers, numbering in the millions and ubiquitous everywhere in the critical infrastructures, that perform jobs previously performed by hundreds of thousands of human technicians during the 1960s and before, in the era prior to the microelectronics revolution. SCADAs do things like regulating the flow of electricity into a transformer, controlling the flow of gas through a pipeline, or running traffic control lights. SCADAs enable a few dozen people to run the critical infrastructures for an entire city, whereas previously hundreds or even thousands of technicians were necessary. Unfortunately, SCADAs are especially vulnerable to EMP. EHV transformers and SCADAs are the most important vulnerabilities to EMP, but are by no means the only vulnerabilities. Each of the critical infrastructures has their own unique vulnerabilities to EMP: The National electric grid, with its transformers and generators and electronic controls and thousands of miles of power lines, is a vast electronic machine—more vulnerable to EMP than any other critical infrastructure. Yet the electric grid is the most important of all critical infrastructures, and is in fact the keystone supporting modern civilization, as it powers all the other critical infrastructures. As of now it is our technological Achilles Heel. The EMP Commission found that, if the electric grid collapses, so too will collapse all the other critical infrastructures. But, if the electric grid can be protected and recovered, so too all the other critical infrastructures can also be restored. Transportation is a critical infrastructure because modern civilization cannot exist without the goods and services moved by road, rail, ship, and air. Cars, trucks, locomotives, ships, and aircraft all have electronic components, motors, and controls that are potentially vulnerable to EMP. Gas stations, fuel pipelines, and refineries that make petroleum products depend upon electronic components and cannot operate without electricity. Given our current state of unpreparedness, in the aftermath of a natural or nuclear EMP event, transportation systems would be paralyzed. Traffic control systems that avert traffic jams and collisions for road, rail, and air depend upon electronic systems, that the EMP Commission discovered are especially vulnerable to EMP. Communications is a critical infrastructure because modern economies and the cohesion and operation of modern societies depend to a degree unprecedented in history on the rapid movement of information—accomplished today mostly by electronic means. Telephones, cell phones, personal computers, television, and radio are all directly vulnerable to EMP, and cannot operate without electricity. Satellites that operate at Low-Earth-Orbit (LEO) for communications, weather, scientific, and military purposes are vulnerable to EMP and to collateral effects from an EMP attack. Within weeks of an EMP event, the LEO satellites, which comprise most satellites, would probably be inoperable. Banking and finance are the critical infrastructure that sustain modern economies. Whether it is the stock market, the financial records of a multinational corporation, or the ATM card of an individual—financial transactions and record keeping all depend now at the macro- and micro-level upon computers and electronic automated systems. Many of these are directly vulnerable to EMP, and none can operate without electricity. The EMP Commission found that an EMP event could transform the modern electronic economy into a feudal economy based on barter. Food has always been vital to every person and every civilization. The critical infrastructure for producing, delivering, and storing food depends upon a complex web of technology, including machines for planting and harvesting and packaging, refrigerated vehicles for long-haul transportation, and temperature-controlled warehouses. Modern technology enables over 98 percent of the U.S. National population to be fed by less than 2 percent of the population. Huge regional warehouses that resupply supermarkets constitute the National food reserves, enough food to feed the Nation for 30–60 days at normal consumption rates, the warehoused food preserved by refrigeration and temperature control systems that typically have enough emergency electrical power (diesel or gas generators) to last only about an average of 3 days. Experience with storm-induced blackouts proves that when these big regional food warehouses lose electrical power, most of the food supply will rapidly spoil. Farmers, less than 2 percent of the population as noted above, cannot feed 310 million Americans if deprived of the means that currently makes possible this technological miracle. Water too has always been a basic necessity to every person and civilization, even more crucial than food. The critical infrastructure for purifying and delivering potable water, and for disposing of and treating waste water, is a vast networked machine powered by electricity that uses electrical pumps, screens, filters, paddles, and sprayers to purify and deliver drinkable water, and to remove and treat waste water. Much of the machinery in the water infrastructure is directly vulnerable to EMP. The system cannot operate without vast amounts of electricity supplied by the power grid. A natural or nuclear EMP event would immediately deprive most of the U.S. National population of running water. Many natural sources of water—lakes, streams, and rivers—would be dangerously polluted by toxic wastes from sewage, industry, and hospitals that would backflow from or bypass wastewater treatment plants, that could no longer intake and treat pollutants without electric power. Many natural water sources that would normally be safe to drink, after an EMP event, would be polluted with human wastes including feces, industrial wastes including arsenic and heavy metals, and hospital wastes including pathogens. Emergency services such as police, fire, and hospitals are the critical infrastructure that upholds the most basic functions of government and society—preserving law and order, protecting property and life. Experience from protracted storm-induced blackouts has shown, for example in the aftermath of Hurricanes Andrew and Katrina, that when the lights go out and communications systems fail and there is no gas for squad cars, fire trucks, and ambulances, the worst elements of society and the worst human instincts rapidly takeover. The EMP Commission found that, given our current state of unpreparedness, a natural or nuclear EMP event could create anarchic conditions that would profoundly challenge the existence of social order.