GLOBAL X
by Mirae Asset

Beyond Ordinary ETFs

About Us

Global X ETFs was founded in 2008. For more than a decade, our mission has been empowering investors with unexplored and intelligent solutions.

Our Team

A diverse collection of more than 80 financial professionals, representing more than five native languages and ten nationalities, bringing together over 200 years of industry experience

Our Business

- Exchanged-Traded Funds (ETFs)
- Research & Insights
- ETF Model Portfolios

Our Partners

- Global Perspective & Reach
- World-renown Index Providers & Exchanges

Our Brand

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Global X Overview: ~$43bn in AUM across 93 ETFs

AUM (US$m) by Fund Family as of 8 November 2021

Thematic Growth	Targeting companies that may be poised to benefit from structural shifts in technology, people and demographics, and physical environment
Income	Offering solutions for investors seeking to increase or diversify the yield potential of their portfolio
International Access	Including targeted sector exposure to China, along with single-country and regional strategies
Commodities	Serving as key portfolio building blocks that seek to deliver exposure to specific factors and values, including ones related to ESG considerations
Other strategies	Seeking to align opportunities for exposure to natural resources across a variety of areas, but chiefly in metals, mining, and agriculture
	Goal of delivering market-beating total returns by following methodologies backed by academic research

Source: Global X ETFs as of 8 November 2021

Content

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Thematic Investing

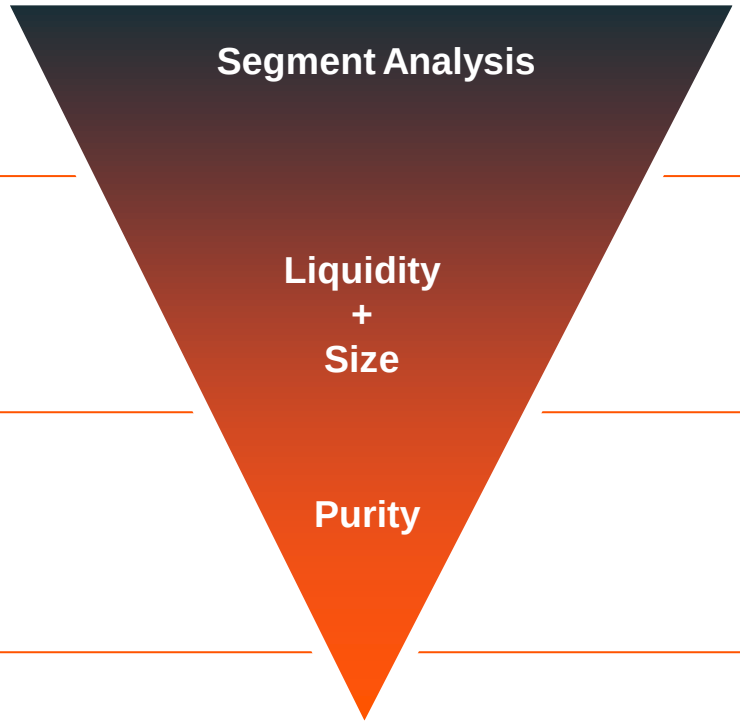
3 Steps for Choosing a Theme

Keys to approaching thematic investing: Look for high conviction themes, investments with high exposure to those themes, and a multi-year time frame.

	Stronger Approach	>	Weaker Approach
Conviction	High, due to observable structural changes in demographics, technology, behaviour, or politics/regulations		Limited, due to conjecture and low likelihood of theme materialising
Investability	Broad group of publicly traded companies, with high liquidity, that provide targeted exposure to the theme		Narrow group of companies with low liquidity, and only tangential exposure to the theme
Time Frame	Medium to long term (5 or more years), making market timing less of a factor		Shorter term placing greater importance on timing

Investability: Focusing in on Pure-Plays

Accurately identifying relevant market segments, industries, and individual companies that stand to benefit from the materialization of the theme is key to maximizing a theme's growth potential.



1. Identify **key segments** & industries that are representative of the theme & stand to benefit from **materialisation of trends** underlying it
2. Screen securities for **liquidity** (average daily value traded, ADTV), free float **market cap**,& **exchange eligibility**
3. Analyse companies' purity to eligible segments & maximise exposure to **pure-play** companies based on relevant **revenue/asset exposure**
4. **Final portfolio** is constructed, reviewed and rebalanced (generally) on a semi-annual basis to ensure ongoing relevance & accuracy

Time Horizon: Differentiating Between Cyclical vs. Structural Themes

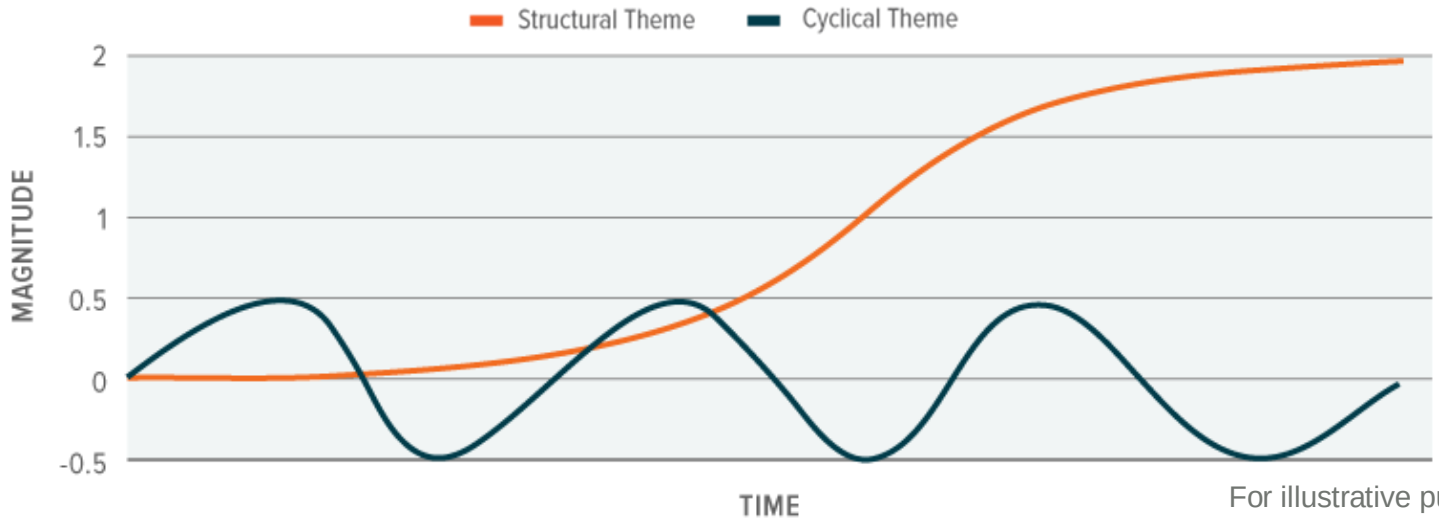
Thematic investing is often used to broadly describe a forward-looking investment approach, but we believe it's important to distinguish between two distinct types of themes: cyclical and structural.

Structural Themes

- Occur as one-off shifts that change an existing paradigm
- Tend to be longer-term in nature
- Typically driven by powerful forces such as disruptive technologies, changing demographics and consumer behavior, or evolving physical environments

Cyclical Themes

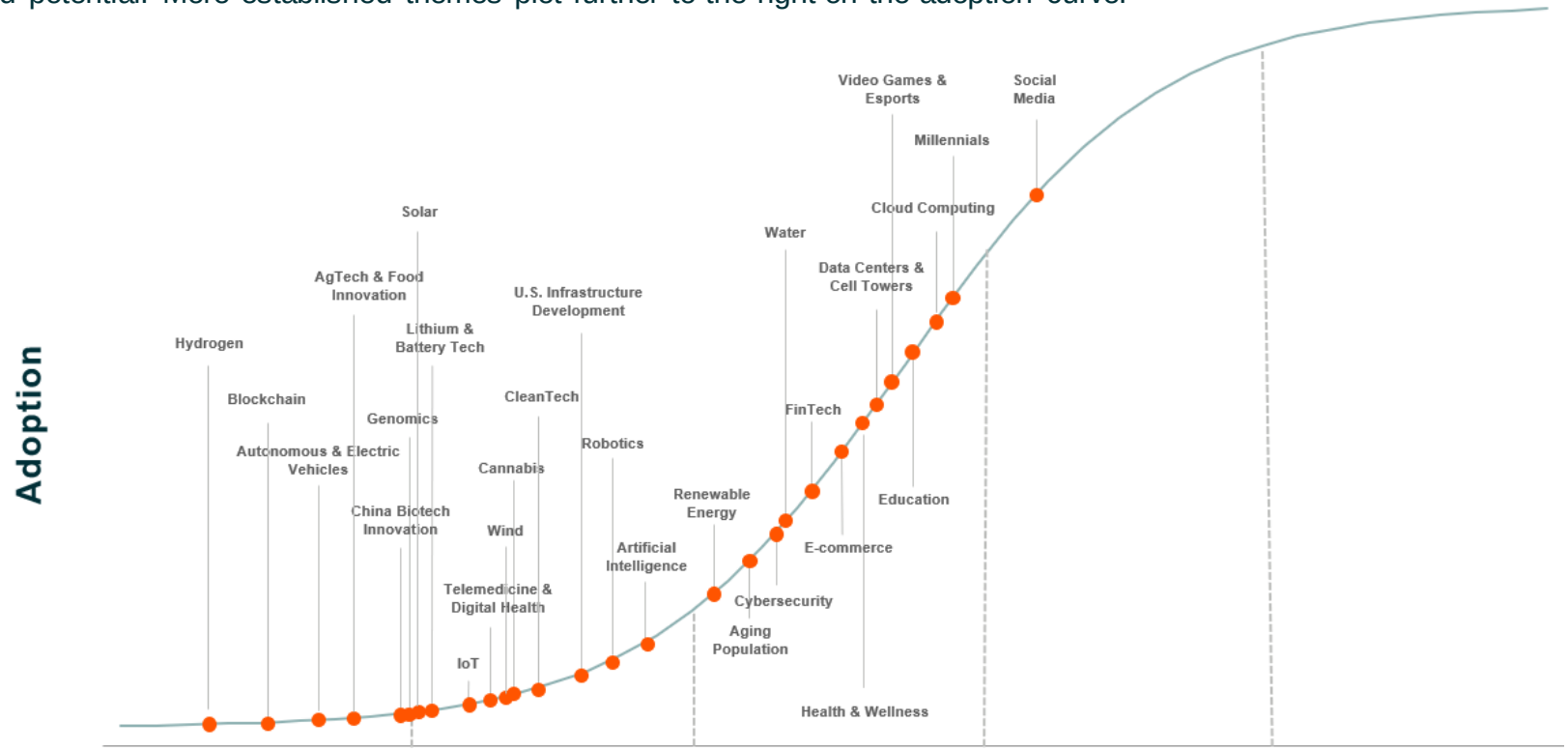
- Occur at mostly regular short - or medium-term intervals, typically based on business cycle changes
- Can be mean-reverting, so that over a long period of time they tend to regress to a normal level
- Examples include asset valuations, volatility, interest rates, and currency values



For illustrative purposes only

Where Do Disruptive Themes Stand?

While each theme follows a unique adoption curve, the chart below estimates the phase of adoption for several themes we cover. Less developed themes plot further to the left on the adoption curve and have both higher risk and higher reward potential. More established themes plot further to the right on the adoption curve.



Adoption	Innovators	Early Adopters	Early Majority	Late Majority	Laggards
Growth	Slow	Medium	High	Medium	Slow

All numbers are approximate

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Portfolio Inclusion of Thematic ETFs

Thematic Investing: Harnessing Disruption in Portfolios

Thematic Investing brings a rigorous and research-driven approach to harnessing **structural changes** around the world. It seeks to identify powerful **macro-level trends** and the **companies that stand to benefit** from the materialisation of those trends.

General Process

Top Down
Identify disruptive macro-level trends and select related high-conviction themes

Bottom Up
Select investments highly exposed to those themes and related trends

Characteristics

- **Long-term, growth-focused** strategies
- **Unconstrained** by geographies & sectors
- **Concentrated**, often in tech & new consumer
- **Relatable** concepts that impact our daily lives

Two Competing Ideas for Portfolio Management

1. Learn from the Past

- Backward-looking
- "History repeats itself"
- Harvesting factor premias/smart beta
- Mean reversion

2. Anticipate the Future

- Forward-looking
- "Next time will be different"
- Growth-oriented investment approaches

Thematic Investing

Potential Advantages of Thematic Investing

1. **Embrace a Long-Term Mindset**: While markets are often more focused on short term earnings, guidance, and macro trends, patient investors can use their extended time horizons to their advantage by allocating to long term themes that may take years to fully play out.

2. **Participate in Exponential Growth**: Due to their more short-term focus, markets often under-value or misprice protracted exponential growth opportunities, presenting opportunities for thematic investors.

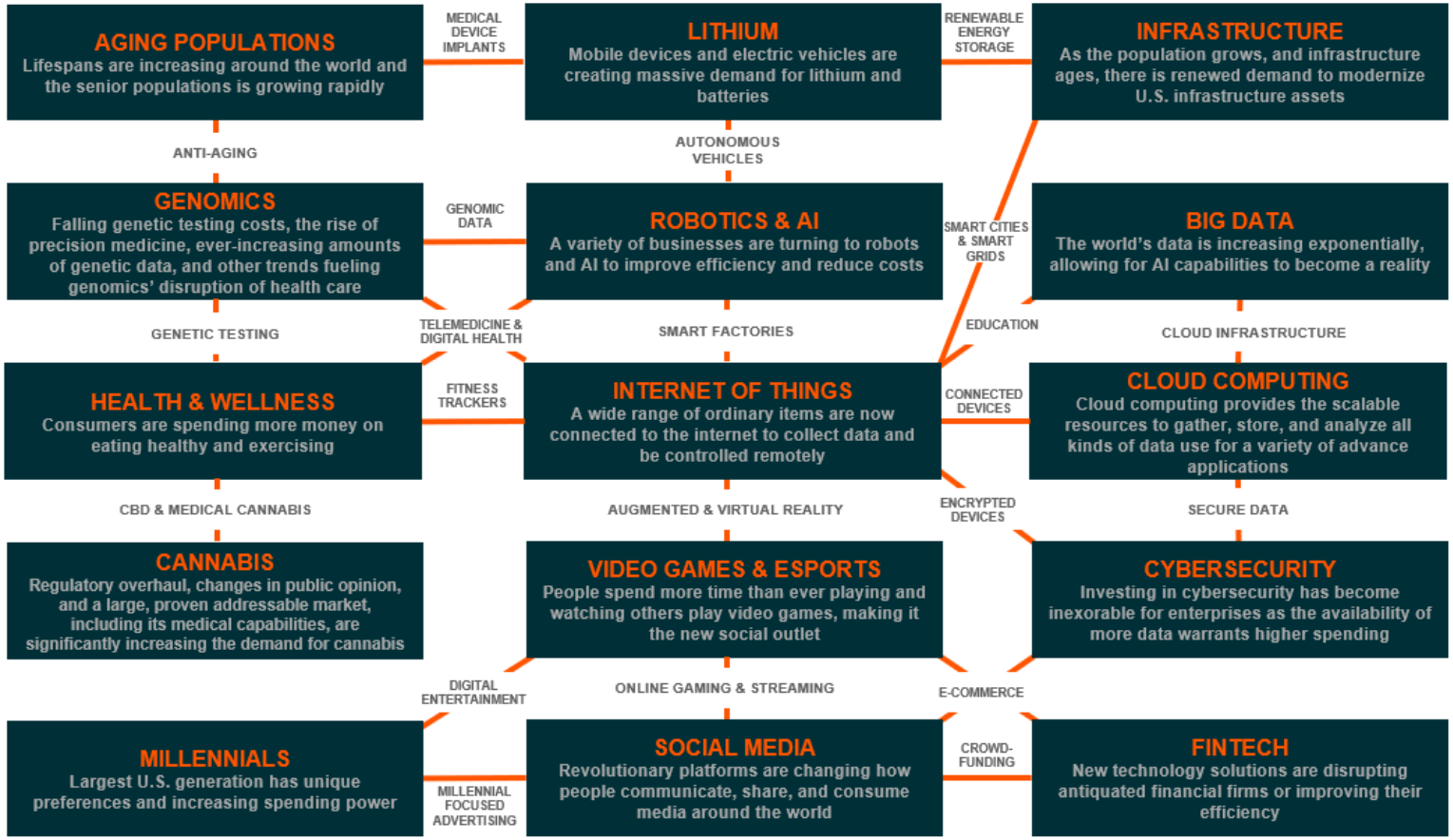
3. **Get Ahead of the Curve**: Leading companies in nascent themes often have small weightings in broad market or even sector indexes. By spotting themes early, investors can lock in exposure before mainstream index inclusion and ownership takes place.

4. **Diversify Returns**: With concentrated baskets of securities and an unconstrained approach to sector and geographic exposures, thematic investing can offer returns with low correlations to other portfolio allocations.

5. **Avoid Being the Disrupted**: Alternatively, not embracing a thematic approach may mean one's portfolio has too much exposure to industries and companies at high risk of being disrupted by changing paradigms.

Diversifying Across Themes

Diversification in thematic investing involves an evaluation of potential holdings overlap, adjacency of themes, sector and geographic concentrations, key drivers, and other potential risks.



All numbers are approximate

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US Infrastructure Development

Climate Change Policies

- The Paris Climate Agreement (COP21, 2015) is seeking to limit global warming to 1.5 degrees Celsius compared to pre-industrial temperatures

- Glasgow Climate Pact (COP26, 2021) reinforces global commitments to accelerate action on climate change but with few binding provisions and should only mitigate a quarter of the emissions needed to adequately reduce warming
    - U.S. and China to increase cooperation on renewable energy capacity expansions, developing regulations, and deploying clean technology such as carbon capture
    - Net-Zero Capital Pledges: More than 450 banks, pension funds, and other firms committed to align 100% of their funds with net-zero emissions targets by 2050
    - Zero-Emissions Vehicles: More than 100 countries, regional governments, and companies (including GM and Ford) pledged to transition to 100% zero-emission sales of new cars by 2040
    - Methane: More than 100 countries agreed to cut methane emissions 30% by 2030
    - Deforestation: More than 130 countries pledged to halt and reverse deforestation and land degradation by 2030

- “Phase down” coal usage

- Annual climate policy annually

- Carbon trading market

Climate-Change Themes

- United Nations Sustainable Development Goals (SDGs): Investing in prosperity
  - SDG 6: Water and Sanitation
  - SDG 9: Industry, Innovation and Infrastructure
  - SDG 11: Sustainable Cities and Communities

- Large fiscal stimulus in the US and Europe to benefit traditional, sustainable and digital infrastructure
  - Europe: NextGeneration EU and Multiannual Financial Framework (2021-2027) combined represent €2tr of investments to support the twin digital and clean transition
  - US: US$1.2tr Infrastructure Investment and Jobs Act and upcoming reconciliation bill (the Build Back Better Act)

Source: Global X ETFs, Bloomberg, "Annual Greenhouse Gas Emissions," Accessed Oct 27, 2020, NASA, "The Causes of Climate Change," Accessed Oct 27, 2020.

Key Themes Set to Thrive in the New Normal Economy

The Pre-COVID Economy → The Stay-at-Home Economy → The Re-Opening Economy → **The 'New Normal' Economy**

While the pandemic may be coming to a close , there are several lingering impacts from COVID-19 that will likely impact the New Normal Economy for years to come.

Potential Long-Term Impact

Changed Consumer Habits

- Increased preference for digital goods & services
- Work from home/remote work more common
- Greater concerns for public health/safety

Weakened Economies

- GDP output gap in the U.S. (expected to be 1.7% in 2021)
- Disrupted supply chains/shortages
- High unemployment
- Surging government debt

Political Uncertainty

- Supranational institutions both under fire and yet more important than ever before
- Rising tensions between US and China

U.S. Infrastructure: Just How Bad is it Really?

America's outdated infrastructure is in dire need of a 21st century overhaul – a C- grade from the American Society of Civil Engineers says as much. Deteriorating roads, waterways, & seaports are liabilities to the country's economic future.

SEGMENT	CURRENT STATE	ECONOMIC/SOCIAL IMPACT
Roads & Bridges	• 43% of roads were in poor or mediocre condition as of 2019[1] • 7.5% of US bridges were structurally unsound as of 2019[1] • Roads and bridges have a $786B project backlog[1]	• Traffic delays cost $166B productivity/fuel (2017)[1] • Traffic fatalities increased 60% in 2019 vs. 2009[1] • Poor road condition cost drivers $130B a year in car repairs[1]
Water Utilities	• 9% of drinking water systems serve 80% of US population[1] • 6B gallons of drinking water are lost to leaky pipes daily[1] • Up to 22M Americans drink water delivered by lead pipes[2] • 20% of US households are not connected to public sewers[1]	• $7.6B in drinking water was lost to leaks in 2019[1] • 63M people exposed to unsafe drinking water in the US[3] • 500,000+ U.S. children have elevated lead levels[4]
Electric Utilities	• 70% of US transmission lines are at least 25 years old[1] • 60% of circuit breakers are at least 30 years old[5] • 6% of electricity providers serve 72% of US customers[1]	• 2018's 'Camp Fire,' was partially caused by faulty power lines and caused $16.5B in damages[6] • Power outages cost the U.S. $28B - $169B, annually[1] • Distribution infrastructure issues cause 92% of outages[1]
Rail & Public Transit	• US passengers took 32.5M trips on Amtrak in 2019, 18.8M of which were in the Northeast Corridor (NEC)[1] • The avg. age of major NEC backlog projects is ~110 years old[7] • 45% of Americans have no access to transit[1]	• 73% of Amtrak trains were on time in 2018[8] • Amtrak's 2018 operating losses were $171M, partially due to delays[9] • Public transit delays could cost riders $1.2B over the next 10 years[10]

43% of roads were in poor or mediocre condition in 2019

9% of drinking water systems serve 80% of the population

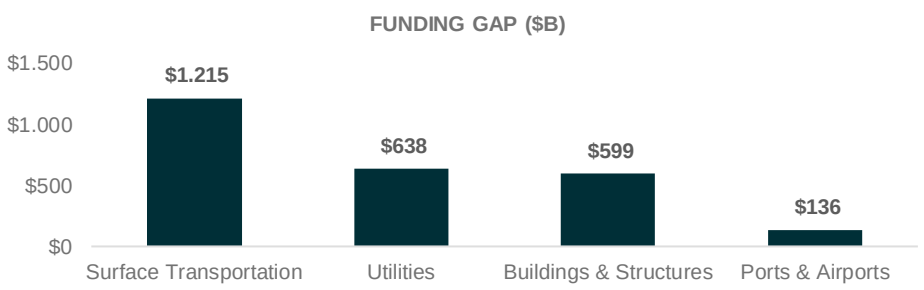
70% of transmission lines are at least 25 years old

Source: ASCE, "2021 Report Card for America's Infrastructure," March 2021.; 2. APM Reports, "Buried Lead How the EPA has left Americans exposed to lead in drinking water," May 2020.; 3. USA Today, "63 million Americans exposed to unsafe drinking water," August 2017.; 4. American Family Physician, "Lead Poisoning in Children," July 2019.; 5. EIA, "Major utilities continue to increase spending on U.S. electric distribution systems," July 2018.; 6. USA Today, "USA had world's 3 costliest natural disasters in 2018, and Camp Fire was the worst," January 2019.; 7. ASCE, "2017 Infrastructure Report Card: Rail," January 2017.; 8. Amtrak, "Train Operations," Oct. 2019.; 9. WSJ, "Amtrak, Seeking to Break Even, Sees Some Light at the End of the Tunnel," November 2019.; 10. ASCE, "Transit," March 2021.

U.S. Infrastructure: Stakeholder Dynamics

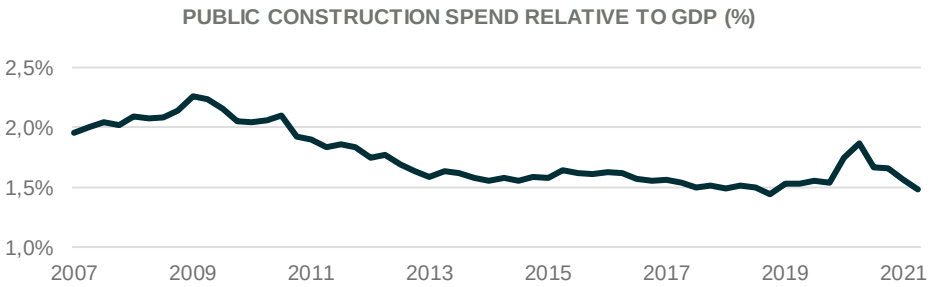
US Infrastructure requires $2.59T of additional investment over the next 10 years. Absent the necessary investment, the country risks losing $10T in GDP, $23T in total output, and 3 million jobs by 2039.[1]

INFRASTRUCTURE SPENDING GAPS SPAN MYRIAD SEGMENTS OF ECONOMIC SIGNIFICANCE



Source: ASCE, March 2021.

U.S. INFRASTRUCTURE SPENDING CONTINUES TO SHRINK RELATIVE TO GDP, INDICATING NEED FOR RENEWED INFRASTURCTURE ATTENTION



Note: GDP data from St. Louis Fed, construction spend from US Census, both seasonally adjusted annual rates.
Source: St. Louis Fed, US Census, Global X ETFs, June 2021.

Source: ASCE,"2021 Infrastructure Report Card," March 2021.

Key Drivers

- **Demographics**
  - Population growth, urbanisation, globalisation
- **Technology/Consumer Preferences**
  - Tech expected to fundamentally change how infrastructure is used/designed
- **Depreciation of current assets**
  - Useful life of infrastructure assets stretched thin
- **Climate Risk**
  - Risk to fresh water, real estate, transport systems, energy grids

From Wishlist to Reality: The Infrastructure Investment & Jobs Act[1]

Bipartisan legislation drafted as a skinnier version of the American Jobs Plan would represent unprecedented infrastructure spending. The $1T package includes $550B in new spending across traditional and next generation infrastructure.

Transportation & Transit

- **Roads, Bridges, & Major Infrastructure ($121B)**
  - Repairs roads, bridges ($40B), funds sensor-based infrastructure
- **Public Transit ($47B)**
  - Upgrades rail/buses (low-emission), brings transit to new communities
- **Passenger & Freight Rail ($66B)**
  - Addresses Amtrak maintenance backlog ($6B), expansion/modernization ($16B)
- **Airports, Ports & waterways ($42B)**
  - Increases capacity/accessibility, modernizes equipment & terminals

Water & Digital Infrastructure + Resilience

- **Broadband ($65B)**
  - Improves broadband affordability especially in rural / lower income areas
- **Water Infrastructure ($63B)**
  - Replaces aging distribution infrastructure, funds clean drinking water initiatives ($55B)
  - Invests in water storage, groundwater sources, recycling, & desalination ($8B)
- **Cybersecurity & Resiliency ($50B)**
  - Barricades key infrastructure (especially water & power) against cyberattack as well as natural disasters

Clean Energy & Sustainability

- **Low-emission Refueling Network ($7.5B)**
  - Funding for EV chargers/hydrogen refueling
- **Environmental Remediation ($21B)**
  - Cleans up superfund & brownfield sites, reclaims abandoned mines & oil/gas wells
- **Power Infrastructure & Clean Energy ($73B)**
  - Invests in power transmission infrastructure designed to accommodate the electrification needs of clean energy
  - Supports and/or invests in smart grid tech, battery storage, green hydrogen & carbon capture as well as hydro, wind, & solar power

GETTING IT BUILT

The Bill would find funding from numerous funding sources, including:

- Redirecting over $200B in unused COVID relief funds
- Early termination in various state unemployment programs ($53B)
- Delaying Trump era Medicare Part D rebate rule ($49B)
- Economic growth assuming 33% return on investment of projects ($56B)
- Sale of wireless spectrum frequencies ($87B)
- New regulatory requirements on cryptocurrency transactions (N/A)

GETTING IT PASSED

- The bipartisan bill passed the House on November 5, by a 228-206 vote
- Possible $1.75T spending package via the reconciliation bill (Build Back Better Act)[2]
- Democrats only need a simple majority to pass a budget reconciliation bill, but moderate & progressive demands could both derail these efforts
- We expect the dual infrastructure packages to pass before year end

All figures derived from bill H.R. 3687, August 10, 2021.; 2. CNN, "Senate Democrats announce agreement on $3.5 trillion top line for sweeping budget package," July 13, 2021.

U.S. Infrastructure Development: Optimised, Not Maximised

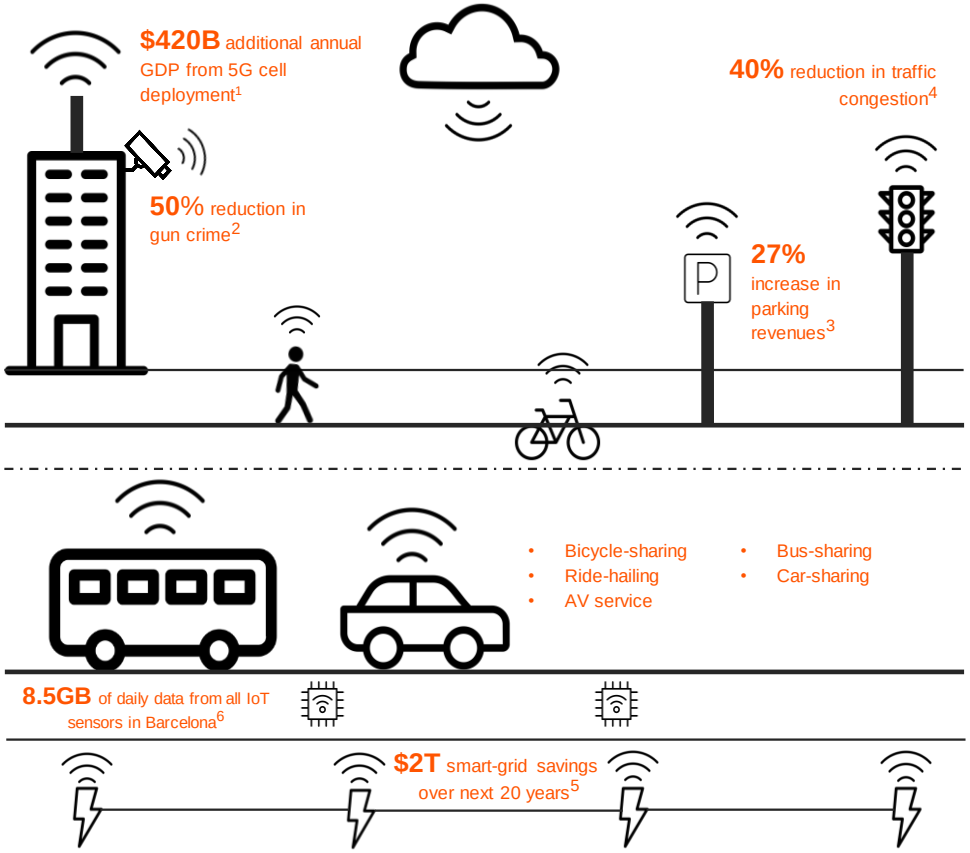
21st century infrastructure needs to be robust enough to support the ever-growing requirements of complex local and global economies, but also lean and dynamic enough to evolve with new technologies and changing demographic trends.

Technology and Infrastructure Converge

- Connected cities with tech-embedded infrastructure, also called "smart cities"
- Commerce-facilitating infrastructure: logistics (aviation, ports), digital payments
- Next-gen networks (5G) as a core tenet of future infrastructure

	5G	4G / 4G LTE
Frequency / Capacity	> 6GHz	< 6GHz
Bandwidth	10-20GB/s	100MB/s – 1GB/s
Latency	~1ms	~10ms

- **100x** more devices connected
- **>5x** increased in responsiveness
- **10-100x** increased capacity/speed



Sources: 1. Accenture, "How 5G Can Help Municipalities Become Vibrant Cities;" Feb. 2017.; 2-5. Ibid; 6. UPC BarcA, "Estimating Smart City Sensors Data Generation," June 2015.

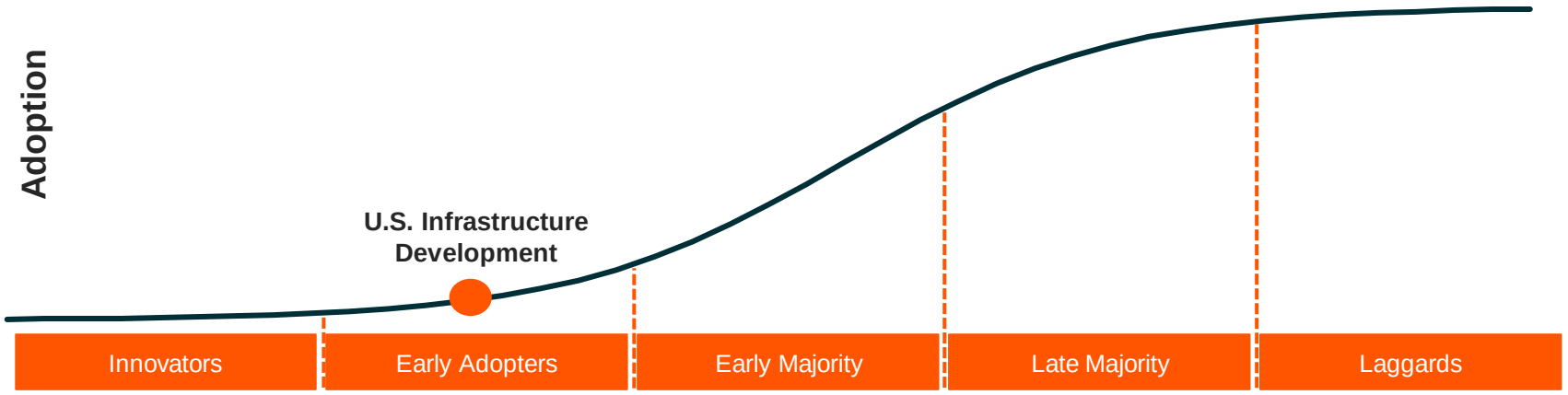
U.S. Infrastructure Development: Beneficiaries & Potential Growth

Associated spending for an infrastructure overhaul we describe would be in the many trillions, across the public and private sectors, and spanning countless industries.

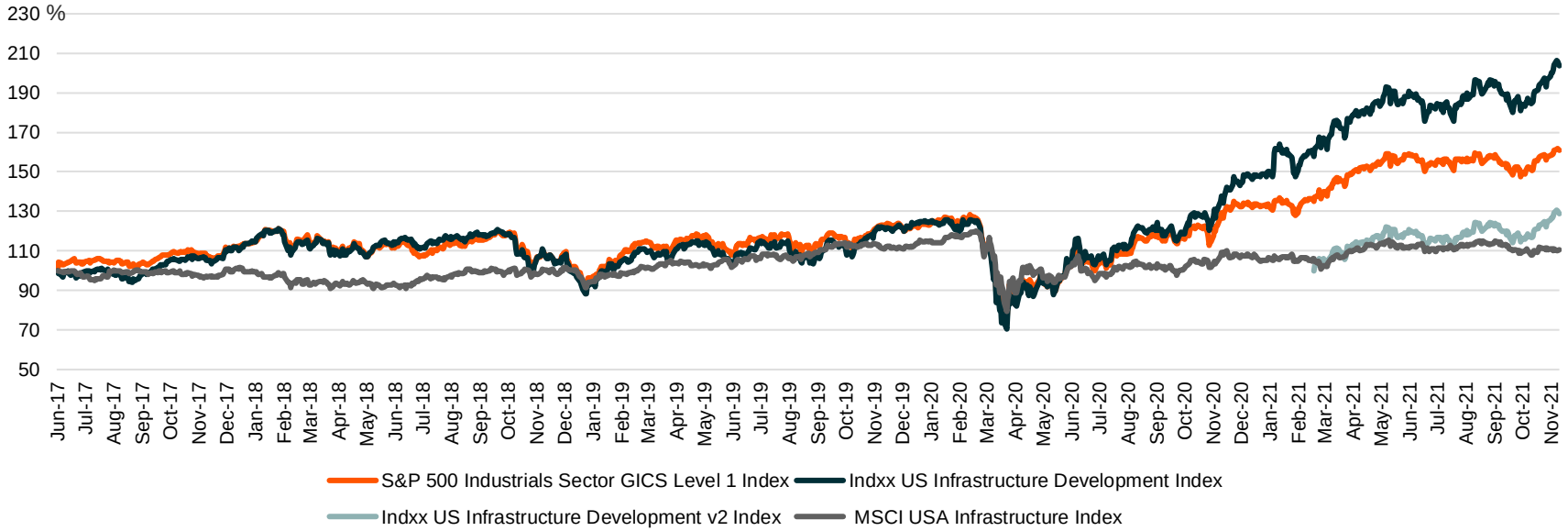
WHICH COMPANIES ARE POISED TO DIRECTLY BENEFIT?

- **Raw Materials and Composites**
  - Aluminum/copper for components, transportation, and electrical transmission
  - Concrete\steel physical foundations
- **Technological Beneficiaries**
  - Industrial automation, robotics, and 5G network deployment
- **Construction and Engineering Products/Services**
  - Heavy equipment producers and lessors
  - End to end project developers, modular contractors, industrial transportation

Displayed for illustrative purposes. Curve shape not indicative of mathematical transformation.



U.S. Infrastructure Development theme versus sectors-specific index



The figures in this chart refer to the past. Past performance is not a reliable indicator of future results.

GICS Sectors Breakdown (%)	S&P 500 Industrials Sector GICS Level 1 Index	Indxx US Infrastructure Development v2 Index	Indxx US Infrastructure Development Index	MSCI USA Infrastructure Index	NYSE FactSet U.S. Infrastructure Total Return Index
Consumer Discretionary		1	1		1
Financials	4		1		
Health Care	1			5	
Industrials	57	72	71		33
Information Technology	31	3	3		
Materials	6	21	22		19
Utilities		3	3	58	41
Communication Services				30	
Energy				7	6

Sources: Bloomberg as of 10 November 2021, S&P 500 Industrials Sector GICS Level 1 Index (01/06/2017=100), Indxx US Infrastructure Development Index (01/06/2017=100), Indxx US Infrastructure Development Index (18/02/2021=100), MSCI USA Infrastructure Index (01/06/2017=100).

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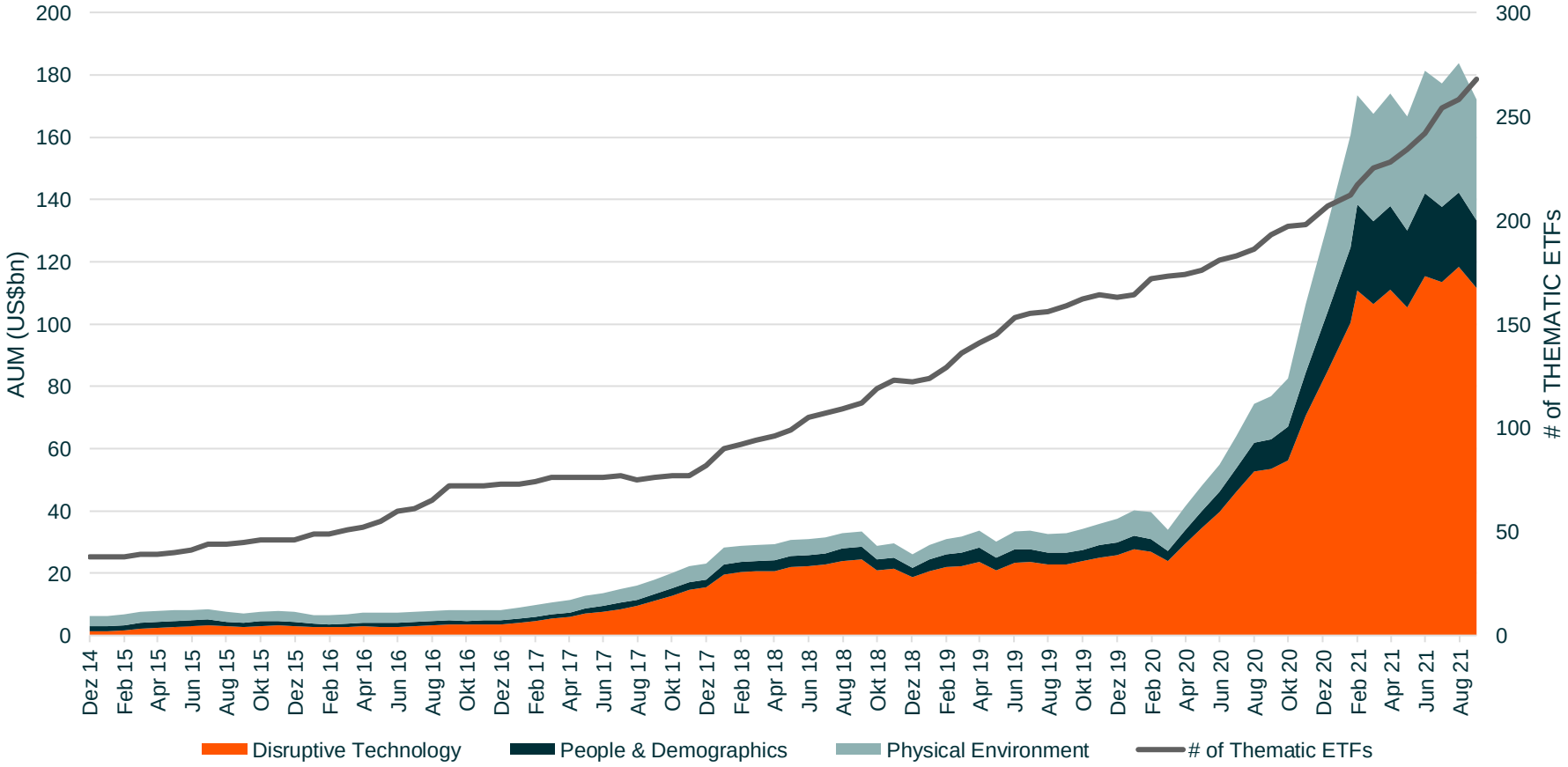
Thank you.

Additional thematic insights can be found online at:
globalxetfs.eu/research, *LinkedIn or on twitter:*

- ***@ROliver_gx***
- ***@MDelledonne_gx***

Thematic ETFs Landscape

At the end of September 2021, there were 268 thematic ETFs* totalling US$172bn in assets under management, up 30% year-to-date.



Source: Data from Bloomberg as of 30 September 2021. *US thematic ETFs and Europe UCITS ETFs combined

Defining & Categorising Themes: Global X's Classification System

Category	Mega-Theme	Theme	Sub-Theme
Disruptive Technology	Big Data	Machine/Deep Learning	
		Cybersecurity	
		Quantum Computing	
		Cloud/Edge Computing	Remote Work, MarTech
	Mobility	Autonomous Vehicles	
		Electric Vehicles	Lithium/Batteries
	Digital Content	AR/VR	
		Video Games	E-sports
		Social Media	
		Streaming	
	FinTech	Mobile Payments	
		Peer-to-Peer Lending	
		Crowdfunding	
		Blockchain	
	Connectivity	Digital Infrastructure	
		5G/Next Gen Networking	
		Emerging Markets Internet	
		Internet of Things	Smart Devices, Smart Cities, IIoT
		Space/Satellite Communications	
	Robotics	AI/Automation	
		3D Printing	
		Drones	
People & Demographics	New Consumer	Millennials & Gen Z	
		Emerging Market Consumers	
		Urbanisation	
		E-commerce	
		Education	
		Sharing/Gig Economy	
		Safety and Security	
		Cannabis	
		Sports Betting	
		Professional Sports	
	Health	Healthcare Innovation	Telemedicine & Digital Health, Genomics, Immunotherapy, Public Health
		Aging Population	Senior Care, Senior Economy
		Health & Wellness	Obesity, Organics
		Emerging Markets Healthcare	
		Alternative Medicine	
Physical Environment	Climate Change	CleanTech	
		Clean & Renewable Energy	Solar, Wind, Hydrogen
		Resource Scarcity	Water, Waste/Recycling, Rare Earths, Sustainable Food
	Infrastructure Development		

All numbers are approximate

Disclosures

The Global X Thematic Classification System is based on the expertise, views, and opinions of the Global X Thematic Classification Committee and are subject to change. Global X defines thematic investing as the process of identifying powerful disruptive macro-level trends and the underlying investments that stand to benefit from the materialisation of those trends. By nature, thematic investing is a long term, growth-oriented strategy, that is typically unconstrained geographically or by traditional sector/industry classifications, has low correlation to other growth strategies, and invests in relatable concepts.

The process of identifying themes consists of three inexorable principles:

1) There must be high conviction that the theme will materialise and have a meaningful impact on segments of the economy or markets. Often this is due to observable structural changes in technology, demographics, consumer behavior, or the physical environment, but can also be influenced by other factors.

2) A theme must be investable, meaning there are publicly traded companies that provide exposure to the concept. Ideally, the group of companies is broad, have high liquidity, and attribute a substantial portion of their business operations (revenues, assets, research & development) to the theme.

3) A theme must be expected to express itself over a medium to long-term time horizon, generally considered to be five years or longer. A longer-term time horizon makes market timing less of a factor in the success of identifying a theme.

Notably, and taking into consideration the principles above, Global X's thematic investing does not consist of ESG, values-based, or policy-driven strategies, unless they otherwise represent a disruptive structural trend (e.g. climate change). Further, funds that adhere to traditional sector or industry classifications, or that are used primarily to gain exposure to cyclical trends (e.g. currencies, valuations, inflation) are not considered thematic. Finally, alternative asset classes, such as listed infrastructure, MLPs, and ubiquitous commodities are not considered thematic. We recognise that these exclusions may differ from other third-party definitions of thematic investing, but it is consistent with, and core to, Global X's thematic classification system and process.

Based on the definition and principles of thematic investing above, Global X has established a thematic classification system that seeks to identify powerful themes and organise them by common traits and drivers. The system consists of four layers of classifications: 1) Categories; 2) Mega-Themes; 3) Themes; and 4) Sub-Themes, with each layer becoming sequentially narrower in its focus.

'Categories' is the broadest layer and represents three fundamental drivers of disruption: exponential advancements in technology (Disruptive Technology), changing consumer habits and demographics (People & Demographics), and the evolving physical landscape (Physical Environment). One layer down are 'Mega-Themes,' which serve as a foundation to multiple transformative forces that are causing substantial changes in a common area. Conceptually, Mega-Themes are a collection of more narrowly targeted Themes. For example, Big Data is a Mega-Theme that consists of Machine/Deep Learning, Cybersecurity, Quantum Computing, and Cloud/Edge Computing. Further down, we identify 'Themes' as the specific areas of transformational disruption that are driving technology forward, changing consumer demands, or impacting the environment. 'Sub-Themes' are more niche areas, such as specific applications of themes or upstream forces that are driving themes forward.