



[#5] About that carbon-neutral college campus...

Many US colleges aim to be “carbon-neutral”. The American College & University Presidents Climate Commitment (ACUPCC) was launched in 2007. So far 606 schools signed the commitment and 477 submitted plans to be carbon-neutral as soon as possible. To get a sense for what these plans are all about, let’s look at some common components:

- Heating buildings with biomass, sometimes with on-site biomass gasification plants
- The purchase of renewable energy certificates and carbon offsets to offset campus carbon use
- On-site installation of wind and solar power generation
- Reduction of electricity consumption in buildings through more efficient HVAC systems, fluorescent bulbs, adaptive/optimized thermostats, reduced stand-by electricity loads, etc

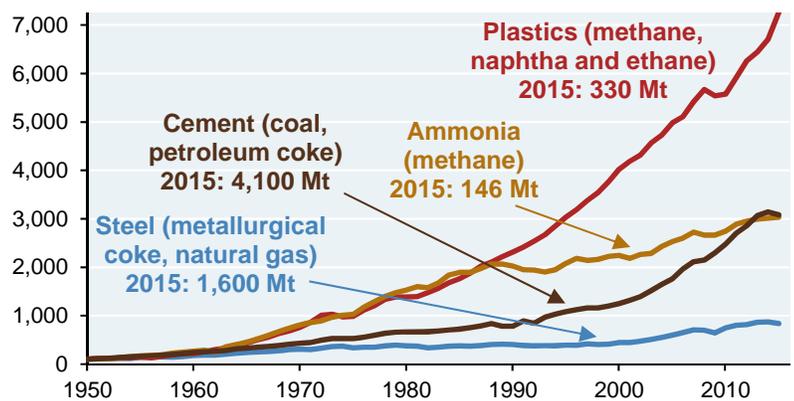
The good news: insulation and energy-efficient materials have reduced energy used in commercial and residential buildings since 1980. Lower building energy consumption is mostly related to heating rather than electricity, since modern computers, servers and telecom equipment (and all the devices required to ventilate/cool them) consume a lot of power.

But still...how can campuses achieve “carbon-neutrality” while the US and the world at large still use fossil fuels to generate 80%+ of their primary energy? Is campus carbon-neutrality a template for the rest of us? Here’s a partial list of **what’s missing** from campus assessments of their carbon footprints:

- Production of steel, cement and plastics needed to build and refurbish university buildings and other infrastructure; highly dependent on fossil fuels, with no large-scale non-carbon alternative
- Food consumed on college campuses, grown with heavy direct inputs of fossil fuels (for machinery) and indirect inputs of coal and hydrocarbons (to produce ammonia for fertilizer), trucked across the country by diesel rigs and packaged in energy-intensive plastic materials
- Clothes students wear, most of which are produced in China (an economy which uses coal for 62% of its primary energy) and which is transported to the US via diesel-fueled container ships
- Cars, SUVs and planes students use to travel back and forth to college, fueled by gasoline/kerosene

So, if we’re just tracking the energy used by students and faculty once they arrive on campus, live in pre-existing buildings, after they’re fed and clothed, and all they need is lights and HVAC, that carbon footprint can be small and reduced further through insulation and efficient building materials. Campus carbon-neutrality efforts also help raise awareness of climate issues. But as a template for the rest of society, which has to generate large amounts of steel, cement, plastics and ammonia to produce structures and food, and distribute them throughout the economy, **it doesn’t really mean that much.** Around 20% of energy used around the world is related to production of steel, cement, ammonia and plastics. If so, until there are mass-scale alternatives to fossil fuels for creating materials upon which modern society is based, we will live in a fossil fuel world.

The 4 industrial pillars of modern society and their primary carbon-based inputs, Production index, 1950 = 100



Source: USGS, PlasticsEurope, CMS, World Steel. 2015. Mt = metric tons



IMPORTANT INFORMATION

Purpose of This Material: This material is for information purposes only.

The views, opinions, estimates and strategies expressed herein constitutes Michael Cembalest's judgment based on current market conditions and are subject to change without notice, and may differ from those expressed by other areas of J.P. Morgan. This information in no way constitutes J.P. Morgan Research and should not be treated as such. Any projected results and risks are based solely on hypothetical examples cited, and actual results and risks will vary depending on specific circumstances. We believe certain information contained in this material to be reliable but do not warrant its accuracy or completeness. We do not make any representation or warranty with regard to any computations, graphs, tables, diagrams or commentary in this material which are provided for illustration/reference purposes only. Investors may get back less than they invested, and past performance is not a reliable indicator of future results. It is not possible to invest directly in an index. Forward looking statements should not be considered as guarantees or predictions of future events.

Confidentiality: This material is confidential and intended for your personal use. It should not be circulated to or used by any other person, or duplicated for non-personal use, without our permission.

Regulatory Status: In the United States, Bank products and services, including certain discretionary investment management products and services, are offered by JPMorgan Chase Bank, N.A. and its affiliates. Securities products and services are offered in the U.S. by J.P. Morgan Securities LLC, an affiliate of JPMCB, and outside of the U.S. by other global affiliates. J.P. Morgan Securities LLC, member FINRA and SIPC.

In the United Kingdom, this material is issued by J.P. Morgan International Bank Limited (JPMIB) with the registered office located at 25 Bank Street, Canary Wharf, London E14 5JP, registered in England No. 03838766. JPMIB is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority. In addition, this material may be distributed by: JPMorgan Chase Bank, N.A. ("JPMCB"), Paris branch, which is regulated by the French banking authorities Autorité de Contrôle Prudentiel et de Résolution and Autorité des Marchés Financiers; J.P. Morgan (Suisse) SA, regulated by the Swiss Financial Market Supervisory Authority; JPMCB Dubai branch, regulated by the Dubai Financial Services Authority; JPMCB Bahrain branch, licensed as a conventional wholesale bank by the Central Bank of Bahrain (for professional clients only).

In Hong Kong, this material is distributed by JPMCB, Hong Kong branch. JPMCB, Hong Kong branch is regulated by the Hong Kong Monetary Authority and the Securities and Futures Commission of Hong Kong. In Hong Kong, we will cease to use your personal data for our marketing purposes without charge if you so request. In Singapore, this material is distributed by JPMCB, Singapore branch. JPMCB, Singapore branch is regulated by the Monetary Authority of Singapore. Dealing and advisory services and discretionary investment management services are provided to you by JPMCB, Hong Kong/Singapore branch (as notified to you). Banking and custody services are provided to you by JPMIB and/ or JPMCB Singapore Branch. The contents of this document have not been reviewed by any regulatory authority in Hong Kong, Singapore or any other jurisdictions. You are advised to exercise caution in relation to this document. If you are in any doubt about any of the contents of this document, you should obtain independent professional advice.

With respect to countries in Latin America, the distribution of this material may be restricted in certain jurisdictions. Receipt of this material does not constitute an offer or solicitation to any person in any jurisdiction in which such offer or solicitation is not authorized or to any person to whom it would be unlawful to make such offer or solicitation.

Risks, Considerations and Additional information: There may be different or additional factors which are not reflected in this material, but which may impact on a client's portfolio or investment decision. The information contained in this material is intended as general market commentary and should not be relied upon in isolation for the purpose of making an investment decision. Nothing in this document shall be construed as giving rise to any duty of care owed to, or advisory relationship with, you or any third party. Nothing in this document is intended to constitute a representation that any investment strategy or product is suitable for you. You should consider carefully whether any products and strategies discussed are suitable for your needs, and to obtain additional information prior to making an investment decision. Nothing in this document shall be regarded as an offer, solicitation, recommendation or advice (whether financial, accounting, legal, tax or other) given by J.P. Morgan and/or its officers or employees, irrespective of whether or not such communication was given at your request.

J.P. Morgan and its affiliates and employees do not provide tax, legal or accounting advice. You should consult your own tax, legal and accounting advisors before engaging in any financial transactions. Contact your J.P. Morgan representative for additional information concerning your personal investment goals. You should be aware of the general and specific risks relevant to the matters discussed in the material. You will independently, without any reliance on J.P. Morgan, make your own judgment and decision with respect to any investment referenced in this material.

J.P. Morgan may hold a position for itself or our other clients which may not be consistent with the information, opinions, estimates, investment strategies or views expressed in this document.

JPMorgan Chase & Co. or its affiliates may hold a position or act as market maker in the financial instruments of any issuer discussed herein or act as an underwriter, placement agent, advisor or lender to such issuer.

References in this report to "J.P. Morgan" are to JPMorgan Chase & Co., its subsidiaries and affiliates worldwide. "J.P. Morgan Private Bank" is the marketing name for the private banking business conducted by J.P. Morgan.

If you have any questions or no longer wish to receive these communications, please contact your usual J.P. Morgan representative.

© 2017 JPMorgan Chase & Co. All rights reserved.