

# Subtraction

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## Abstract

The theme of this year's Holcim Forum considers the under-researched construction industry – a sector that has historically been the impetus for capital expansion, stock markets, infrastructure and labor migrations as well as a proxy of the state in national and international infrastructure building, war and reconstruction. The construction industry is an infrastructure that makes infrastructure and a self-sustaining building machine that joins forces with many different kinds of economic multipliers in the form of, for instance, contagious details, financial instruments or populations of spatial products. This project looks at entrepreneurial projects that make it profitable to put that machine in reverse – to disassemble rather than assemble building. Buildings like casinos, sports stadiums and high-rise housing, however substantial, are routinely imploded not because they are old or non-functioning but because even the most ephemeral programmatic wrinkle renders them obsolete. Recent economic failures dramatically demonstrate the degree to which buildings like single-family houses are, in some sense, as volatile and immaterial as currency. Developing countries with both valuable forests and valuable oil reserves use carbon trading instruments that essentially create a market for not developing or, in some cases, for removing the traces of development. Despite disciplinary incantations about firmitas, given cases like these and others, one might imagine that both the appearance and disappearance of buildings should be the basis of profitable industries. Moreover, the subtraction of building need not necessarily be seen as merely a minor recycling adjunct of building. Some of the most pervasive sea changes in economies and modes of production often result from an unexpected combination of mundane or unremarkable endeavors. Currently there are a number of techniques for subtracting building – from implosion and demolition to deconstruction by hand to nullifying financial instruments. Subtraction reviews all of these efforts in play and forges links between them in a network that includes labor opportunities, material tracking and material reuse. Only a few isolated and small-scale studies have considered the issue. The project searches for just the right combination of factors that might allow building subtraction to emerge from the anecdotal to a stable realm of the construction (or deconstruction) industry. In addition to a text, Easterling will generate a short animation about building subtraction.

Building subtraction, as a heavy industry and a design protocol, is an emergent global enterprise capable of making negative development profitable. While frequently regarded as demolition, waste or loss, subtraction economies allow the building, the physical outcropping of real estate market, to approach the flexibility and volatility of the throbbing financial envelope that surrounds it. The two active forms offered here - a marketplace for material recovery and a new playbook for gaming space - position negative development as an aggressive and lucrative means of mining the city.



Stream



Take Away

"**STREAM** is GPS version of Ebay/Amazon for Construction and Demolition materials. Mistaking remaindered materials for waste obstructs the material stream. The proposed app provides a digital, mobile marketplace for quickly assessing their actual value.

"**TAKE AWAY** is a game that alters perceptions of negative development. Played like a reverse game of GO, it values clearing rather than obstacle. It rehearses the proposed playbook of property networks."

## 1 Subtraction

Unlike agriculture, where planting and harvesting come in quick succession, construction and subtraction are rarely regarded as cyclical, even within cyclical building markets. Construction is typically treated as the establishment of a permanent fixture the subtraction of which may even be seen as a tragic or wasteful loss of value, property or monument. Building subtraction, treated as the unskilled labor of demolition, is associated with waste that must be quickly carted off and furtively dumped somewhere in the margins. It should give way to the real objective of this heavy industry - a newer and fitter design. When not associated with some form of speedy annihilation, subtraction is alternatively associated with pious, Quixotic virtues of saving or recycling, as attended by glacial processes of reform and regulation. Meanwhile, financing and marketing industries make of this seemingly static and durable envelope, be it a small house, a massive sports stadium or a 4000-room casino,

a volatile balloon of inflating and deflating value. Yet the recent implosion of building assets as well as their association with toxic waste and negative value contains the germ of an emergent economy.

In a subtraction economy, physical building envelopes approach the flexibility of their financial envelopes such that even negative development is profitable. In this context, “Mining the City” is much more than a poetic or hopeful suggestion. It is an apt term to describe an extraction process comparable to those of the late 19<sup>th</sup> and early 20<sup>th</sup> century in which a heavy industry went in search of something perceived to have lasting and even accrued value through use and reuse (e.g. a precious metal or a diamond). The subtraction industry similarly manipulates heavy tangibles of material reuse and urban form as well as ephemeral intangibles of financial structures. The project that accompanies this article posits two enterprises to contribute velocity to the subtraction economy. One tunes up the value of subtracted building with a broader marketplace for the expended materials. While partners and beneficiaries, material recovery industries alone cannot deliver an economic jolt sufficient to ignite a subtraction industry. A second more aggressive entrepreneurial playbook games space with interdependencies between properties - properties tied not only to derivatives or futures in the global financial market but also to other spaces in a more complex urban organization that even stabilizes investment with negative development and building deletion.

## 2 Political Disposition

The subtraction economy, in many ways, already exists. The creative trick lies not in naming it, but rather designing a political disposition for this almost obvious idea - the spin or English that gives the idea some play and traction. Buildings have long been mined or harvested for their materials, and development schemes have long made a casino of physical space. It is an attribute that is nearly visible with the naked eye in familiar developments from dense skyscraper cities to suburban developments to proliferating palms in Dubai. Buildings are harvested every day and replaced with newer formulas for profit. In the art of inverting central and marginal positions, economies of scale must be powerful enough to interrupt free market doom loops or other political stalemates that resist intelligence. (For this, the US context provides an enticing puzzle.) The subtraction industry might be compared to the nascent containerized shipping industry within which several watershed events accelerated growth in the industry. While a confusing proliferation of locking mechanisms initially stalled growth, ISO standardization of the container and locking mechanism, together with the discovery of new economies in double stacking containers on train cars, catalyzed the shipping and materials handling industry - an industry that rapidly developed tools to obsessively micromanage every possible parameter for optimizing profit. Similarly, there are a number of emergent episode that begin to galvanize subtraction economies. For instance, implosion techniques have become popular for building types like casinos or stadiums that are frequently destroyed and rebuilt in response to seemingly ephemeral parameters related to new program wrinkles or desires. They accelerate the time-lapse of building and rebuilding to reveal that, while buildings are frequently associated with permanence, they are attached to unstable, changeable marketing formulas. Countering expectations, implosion works well on buildings that are relatively young and structurally coherent. Moreover, the implosions themselves have been sources of spectacular entertainment, like the familiar New Year’s Eve implosions in Las Vegas.

The Japanese construction giant, Kajima, is developing not only new construction heroics but also new technologies for building deconstruction. Given the value of land in urban Japan, there is a premium on a surgical subtraction that actually lowers on jacks successive floors in a multi-story building so that all demolition work can be performed on the ground floor with greater safety, economy and a 99.4% rate of recycling. Available from: [http://www.kajima.co.jp/csr/report/2008/pdf\\_e/csr-e-38.pdf](http://www.kajima.co.jp/csr/report/2008/pdf_e/csr-e-38.pdf) [Accessed January 31, 2010]

Since most of the tonnage of materials in the world goes to making roads and most successful reuse scenarios involve roads, road construction and removal attracts equipment innovations and economies of scale that make material mining a successful enterprise. The trade journals like Construction and Demolition Recycling Magazine are filled with “advertorials” for material mining equipment that uses magnets, screens, blasts of air or bouncing and waving conveyors to separate materials. Some of the vehicles are essentially mobile recycling plants, not unlike a harvester or combine, that tune subtraction economies by eliminating transportation costs. A vehicle like the “Eco-Crusher,” or the “Quarry Trax,” can demolish a roadway and distribute the crushed material all along its length where it will be needed later as soil stabilizer. *Construction and Demolition*

*Recycling*, July/August, 2008, 36-42, 54. Available from: <http://cdrecycler.texterity.com/cdrecycler/20080708/> [Accessed January 31, 2010].

From the blunt instrument of slum clearance to selective demolition and replatting, cities have long manipulated violent ecologies of subtraction to change urban land values. Yet, in cities like Detroit, the Bronx and Philadelphia invisible shockwaves of value attrition and disenfranchisement pass through the city and reduce it to rubble without need of bulldozing municipal programs. Other force fields of subtraction, like, for instance, a highway network, clear not only the land they physically occupy but also a quotient of territory that radiates from them. Other programs that require space or isolation, such as electrical lines, wind turbines or flight paths may also require a clearing of land.

Regulated since 1972, German material mining is a mature industry that recycles over 85% of construction materials. Architects and engineers train to address an obligatory “Kreislaufwirtschaft” or life-cycle infrastructure of material streams. Germany has developed material classifications, and assisted in crafting ISO’s quality assurance standards for construction and demolition waste. The German automobile industry tracks and barcodes its material streams. Kreislaufwirtschaft principles are also working on elevating reuse values for concrete and brick rubble. (COWAM, 2006)

Marshalling the abstract financial and environmental valences of physical territory, the REDD (Reduced Emissions from Deforestation and Degradation) program or the Yasuni protocol in the Amazon demonstrate the potential profitability of negative development. REDD trades intact forest for emissions credits. The Yasuni protocol trades in certificates that pay to keep oil in the ground beneath an especially rich and sensitive forest preserve. Both programs yield a net value to undeveloped land.

### **3 Active Forms**

While any number of amplifications or combinations of these practices already provides the underpinnings of a profitable subtraction economy, a materials marketplace and a playbook for gaming urban space could further enhance its political disposition.

#### **3.1 Materials Marketplace**

An industry to extract or harvest construction materials juggles a complex cocktail of parameters including regulatory incentives, equipment, volume, reuse scenarios and transportation costs. A material alchemy of these factors can psychologically and economically alter the value of material. One emergent phenomenon within material management systems is special software that crunches numbers between these variables to discover opportune relationships within a market. For instance, in the UK, WRAP (Waste and Resources Action Program), a non-profit group that works with the construction and demolition industry to develop markets for recycled products, provides a powerful web tool for calculating profitable recycling. Available from: <http://www.wastecycle.co.uk/wastecalculator.html> [Accessed January 31, 2010].

In the US, the Environmental Protection Agency (EPA) has sponsored “decision support tools” to help waste managers test scenarios and determine new environmental economies, but aimed at the broad spectrum of solid waste, such a tool does not exist solely for construction and demolition waste. (EPA 530-FF-02-024; Thorneloe, et al. 2007). The MSW-DST, for instance, is complex enough to consider several different scenarios for material pathways in conjunction with a life cycle database figures for materials and processes. Amidst anecdotal state regulations, the EPA establishes no national waste regulation but rather offers encouragements or “challenges” to business to recycle a relatively low 35% of materials. (Clark, et. al., 2006) <http://www.epa.gov/epawaste/conserva/rrr/rmd/econres.htm> [Accessed January 31, 2010] The three largest waste managers in the US have multi-billion dollar businesses and already have their own techniques for calculating profits. An emerging trade industry, including groups like the National Demolition Association (NDA) or the Construction Material Recycling Association (CMRA) struggles to create salience and volume.

As an alternative to a web-based calculator, a web-based *market place* has ramifying and potentially more powerful consequences in the US scene. Again, if some of the best ideas inflect and reposition a situation that already exists, a materials market place is not dissimilar to any of the other web-based markets like Amazon or Ebay that have entirely changed the audience and venue for trading new and used goods. During this financial

crisis, many of the components of homes and work places have been traded in these markets. Portable fixtures, appliances, equipment, interior finishes, remaindered tools and materials - from floor boards to portable recycling plants like the Eco-Crusher itself - have been sold on Ebay. A materials market could extend to not only small lots of used surplus material but also tonnage or volume of material removed in a building subtraction.

A used bookseller on Amazon determines price by referencing a database of ISBN values, calculating shipping costs in relation to the weight of the book and making a bid in relation to those of other sellers. Similarly, a very simple building material calculator/converter that could reference selected market values (e.g. dollars/tons of copper, local transportation costs/ton) would be the equivalent of a quick ISBN reference. The user would list tonnage and location, but as with the on-line marketplace in general, the prices and bids themselves provide the live feed or the market database. Just as the seller's and buyer's reputation grows on Amazon or Ebay, so the material supplier will earn a reputation for the condition and presorting of the expended material. While large amounts of waste might continue to be handled by large facilities, such a market would encourage entrepreneurialism among the small and midsize operators, now able to grow their own volume by harvesting the materials from numerous construction projects. The seller, who used to pay a disposal fee for material previously known as waste, can either sell the material or trade its value for removal. Already for the largest disposal companies, simpler or more casual equipment, like the 3-yard nylon bag, often replaces metal containers. The smart phone applet might deploy GPS to facilitate this harvest. If the greatest obstacle to productive volumes in the construction and demolition material stream is the sense that speedy disposal is the only option, a web-based market place on a GPS-enabled smart phone, would allow quick reference of an alternative harvest.

With a sly and resourceful political disposition, material mining in this marketplace quickly becomes a game within which compounding volumes and opportunities gain a momentum that inoculates against bureaucratic delays and powerful lobbies. Allied industries related to the various recovered materials such as concrete, gypsum, wood, steel, asphalt, aluminum and copper can build their industries around viable volumes and myriad reuse scenarios. The more valuable metals have long had a market as the gold teeth in building. Concrete is a matrix that has come to accept many different kinds of recycled material from glass to asphalt shingles.(Meyer, 2008) Reused wood is now part of a biofuel market that must outwit the coal lobby. In the US, the gypsum reuse industry needs substantial renovation to be able to cycle the material from sheetrock back to sheetrock. Like the transshipment industry, the material mining industry will likely sponsor unforeseen territories of obsessive managing and chiseling within which buildings, composed of a bar-coded index of materials, become "inventory." Material mining can invoke the patriotism of a WWII population that saved cooking oil for munitions production as it also appropriates the label of those extraction industries that typically oppose environmental sentiments. While there is a great deal of automation in the material management industry, employment opportunities range from simple unskilled jobs to environmental scientists to entrepreneurs of all kinds.

A live marketplace begins to provide significant velocity to overcome obstacles to profitability in the subtraction industry. Yet, surpassing the goals of material recovery alone, subtraction entrepreneurs need further techniques for extracting profitability from negative development.

### **3.2 Gaming Space**

While there are elaborate schemes for manipulating the virtual values of buildings within the thickening layers of finance, there are fewer formulas for mining the value in physical spatial layers. The owner of a stadium, casino, office building or home, would hardly have any incentive to dismantle it for the value of material alone. The value of the intact building and lot would frequently be worth more than the lot and its expended building material. The demolition of the casinos or stadiums is frequent and routine because the physical envelope approaches the flexibility of market and financial instruments and because there is something more lucrative to replace it. The classic formula for profitability involves replacement with a larger or denser building within which the developer not only recoups the building material, but also mines the space of the city for all of the profits that can be extracted from it. The elementary assumption is that densifying adds value, except in locations where lack of demand creates diminishing returns.

By spatializing risk and property interdependence, a formula for subtraction would need to make building deletion profitable, even in (perhaps especially in) remote areas. Protocols or active forms designed to give

physical form the flexibility of financial formulas facilitate this negative development while, ironically, stabilizing a market. For instance, the deceptively simple formula for an 18<sup>th</sup> century settlement like Oglethorpe's Savannah created dependencies between components - active forms with time-released powers designed to curb rampant speculation. The lot was not an independent absolute value but was often abstractly linked to other values and physical spaces in other portions of the plat. Parcels that were placed in formations composed of interdependent ratios. A ward was made up of ratios of public and private lots abstractly linked to their central square, and while this is similar to any allotment garden or common used throughout history, the lots and central space were also collectively linked to remote reserves of land outside of town.

In the suburban landscape of US McMansions, where further densification of building would, at some point, result in diminishing returns, a lot tied not only to derivatives on the global market but also to another piece of land becomes part of a complex game of lot futures and lot hedge spaces. Beginning simply with the standard gamble on densification, the value of one lot and one house or commercial building would usually be less than two lots and two houses or commercial buildings. In some cases the value of two lots and the material remains of one building may be worth more than one lot and one building. Densification increases the municipal tax revenues, and the refinanced status of the original mortgage assets generates bank profits. Compounding benefits result when some number of these densifying moves provides revenues for the purchase of a more remote lot - a lot that needs to be relieved of its role as a building site, revalued for another use and converted into shares. If, for instance, for every 10 doubled housing lots the municipality purchases one remote housing lot, the municipality would be able to determine the use of that lot once building has been subtracted. The 10 doubled housing lots own shares in the value of that remote lot and now have extra dividends to help offset the risk of their own real estate deals.

In a subtraction economy developers and cities wield somewhat less violent tools of acquisition, for instance, energy or infrastructure related rights of way. A more distributed entrepreneurial ecology offers some safeguards against disenfranchisement. Owners that might be targets of foreclosure or clearance have a hedge space, remote or nearby, that is hard to target. Suburbia needs open space for a number of enterprises just as New World settlements needed agricultural space. As a reserve of value, the remote lot eases the city's start up costs for innovations like solar, wind or rail for which land acquisition creates an obstacle. Those with a small share in the subtracted lot might reap small dividends in tax credits for open space or large dividends from their share in a transportation or energy enterprise. The protocol might be used in any location where development would be wise to retreat, from flood plains and special land preserves to vast pastures of sprawl.

Ironically, the subtraction playbook stabilizes development investment by deleting development. When banks create profit structures that do not originate as spatial formulas, they are likely to have haphazard rather than directed spatial consequences. If cities and entrepreneurs create the active forms of profitability for banks, not the other way around, they create not futures trading and hedge funds but remote lot futures and hedge spaces. While densified sites attached to remote sites offer one elementary formula for negative development, the emergent player, some combination of a flipper and a quant would no doubt devise an ever more elaborate playbook, a show on HGTV and a DIY contingent whose home improvement projects include demolishing the house. And while any of these might become dangerous, they would be harder to hide.

Whether in the bloated and failed development of the US, in the environmentally sensitive areas of the Amazon, in fault lines or flood plains, the active forms of urbanism need lucrative techniques for throwing the development engine in reverse and making of subtraction a form of growth.

## Literature Review

### Selected papers:

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[http://www.kajima.co.jp/csr/report/2008/pdf\\_e/csr-e-38.pdf](http://www.kajima.co.jp/csr/report/2008/pdf_e/csr-e-38.pdf) [Accessed January 31, 2010].

### Selected industry websites:

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### Interviews:

Telephone interview, Carl Rush, Vice President Organic Growth Management, Waste Management, Houston, Texas, January 22, 2010