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// JUNE 2018

FAB CITY

TOWARD PRODUCTIVE CITIES

FABCITY INDEX FRANCE

TOWARD AN INCREASINGLY LOCALLY PRODUCTIVE MODEL

In comparison to other Western economies, it appears France is often affected by deindustrialization and strikes which cause both a decrease in industrial production and loss in manufacturing jobs. As a result, the proportion of foreign goods have increased in French household. Foreign products currently account for two thirds of French imports leaving France's trade balance in red for over ten years. Furthermore, this increasing dependency upon foreign products implies wide-scale outsourcing of associated environmental impacts which stem from the very nature of manufacturing activities – the extraction and transformation of natural resources – and constitute some of the most pressing environmental challenges of our times, from climate change to resource depletion to loss of biodiversity…

A «productive city» aims to increase its capacity to produce what it consumes by relocating manufacturing within its perimeter, drawing on local material resources (renewable resources, circular economy...) to produce locally while fostering global connections with worldwide collaborative networks (data, design, know-how, etc...)

RE-ANCHORING MANUFACTURING WITHIN CITIES, A NECESSARY BALANCING ACT FOR GLOBALIZED ECONOMIES

To some it may seem that France's interests today lie in a further integration of a global value chain and developing industries that offer the country a competitive advantage. In this context, why should cities be encouraged to embed manufacturing within their economic fabric? Simple because, from an economic standpoint there is a no other choice.

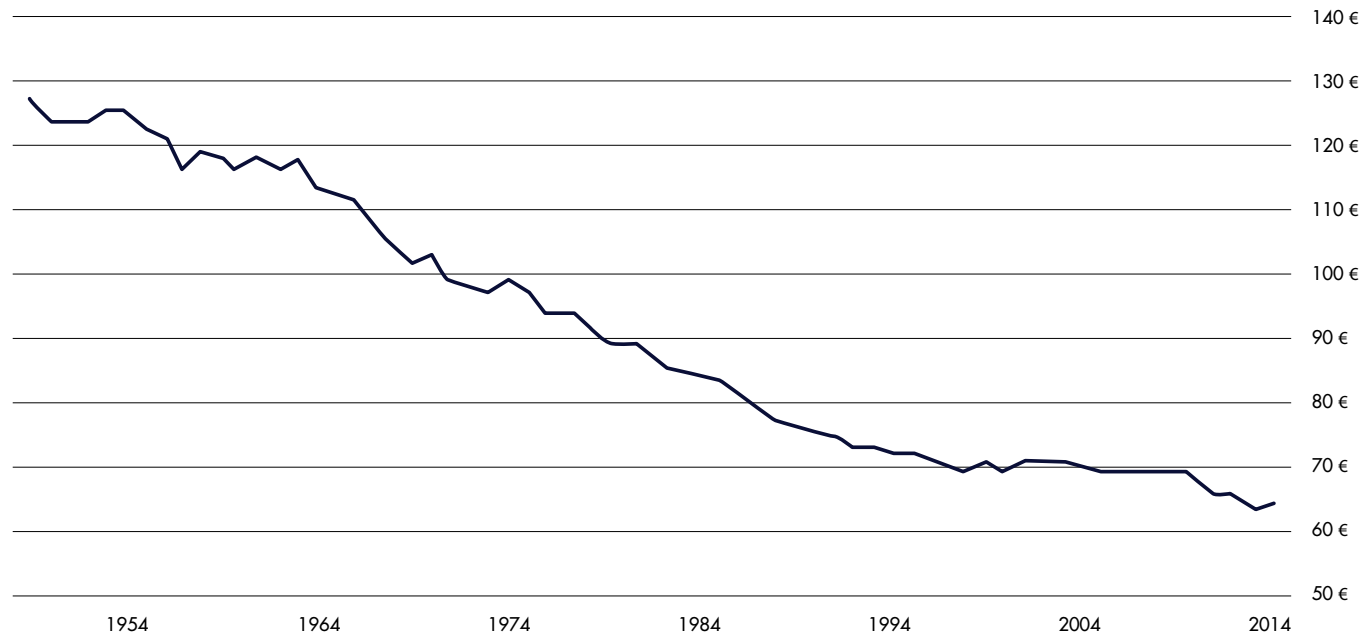
Indeed, the debate surrounding reindustrialization these last years has debunked the myth of the "factoryless manufacturer" and exposed the realities of "global costs" associated with international supply chains: issues with product quality, sluggish reactivity, intellectual property violations, reputation risks connected with the environmental and social impacts of suppliers, difficulties when seeking to adapt or personalize product offer, etc. Moreover, there is a growing awareness that outsourcing all production activities can be a hindrance to innovation, considering a company's innovation feeds on interchange with its production facilities, as well as with suppliers and customers.

Furthermore, manufacturing activities tend to have a vital effect on an area's economic fabric: the issue at stake here is how to effectively harness this potential.
Recent research led by Utopies in France and the USA[1] has shown that an area's prosperity depends on three main factors: capacity to export goods and attract tourists, capacity to attract residential income that is not generated locally (retirement pensions, private income and annuities, income from labor that is not based locally, etc.) and finally the local multiplier effect which refers to an area's ability to retain and circulate riches locally, for instance by buying local products at locally owned businesses. The multiplier effect can only fully kick in when urban areas display economic diversity including a significant proportion of manufacturing facilities.

Today, over a third of local prosperity can be attributed to the local multiplier effect. Yet, how many territorial entities dedicate one third of their development efforts to reinforcing their local economic circuits? Far too few. Even more surprising, unaccounted local economic development policies; **the local multiplier effect has dropped significantly over the last 50 years.** In 1970, a French company that produced €100 worth of manufactured goods generated an additional €103 within its national supply chain on average. In 2015, the average multiplier stood at €59, a 43% drop (-60% in the automotive or plastics industries). Why such a noteworthy decrease? In embracing globalization, most countries have adopted international supply chains which fragment and scatter each step of the production process (design, manufacturing, assembly, commercialization) on a global scale. This process implies geographical hyper-specialization which has in turn robbed national economies of industrial diversity by outsourcing certain industries to other countries, thus weakening each country's multiplier effect and its associated potential for creation of wealth… Which in turn pushes countries to further embrace globalization in search for new sources of wealth, creating another wave of specialization which generates still more exports, but also more imports (including inputs needed to produce these new products for export), inducing a further decrease of the multiplier effect… **To neglect the issue of local manufacturing will inevitably lead to an acceleration of this vicious cycle.**

01 : " The contribution of the local multiplier effect to regional development, The example of the United », January 2018, Arnaud FLORENTIN & Boris CHABANEL

Drop in the multiplier effect in the manufacturing industry since WWII
(Impacts in the French supply chain for €100 of manufactured goods)



In addition to traditional approaches focused on enhancing export competitiveness, attractiveness and capture of external wealth, the time has come to take into account an often-different economic asset: local demand. It is here, in unmet local demands of households, companies or administrations, particularly where no local offer exists, that thousands of potential local niches exist waiting to be seized by a new generation of *manufacturing entrepreneurs* as well as by big corporations who wish to bring their production activities closer to consumers through micro factories, collaborative factories, food labs, micro slaughterhouses, micro-creameries, micro-breweries, micro-farms, urban agriculture, peri-urban farms, methanation micro-units, industrial ecology ecosystems, eco-landfills, cardboard- or wood-recycling micro-units, household equipment repair micro-centers, textile upcycling fablabs, neo-craftsmanship, etc.

THE FABCITY INDEX MEASURING A CITY'S CAPACITY FOR SELF-SUFFICIENCY

What about the manufacturing autonomy of French cities and urban areas in 2018?

The FabCity Index is an indicator designed to assess French cities' ability to produce what they consume. Household consumption in a given area draws on direct production (manufacturing of equipment goods, food and beverage, fashion…) as well as indirect production (raw materials, ingredients, semi-finished products, other miscellaneous inputs, equipment, machines and tools necessary to manufacture locally-consumed goods…).

The more a city is able to cover its own direct and indirect production needs, the higher its FabCity Index.

How is the FabCity Index established?

Each urban area is evaluated over 257 sectors (broken down into 12 macro-sectors) covering both direct and indirect production:

- Agriculture, fishing industry
- Extractive industries
- Forestry, woodwork
- Mineral construction materials
- Metal industry
- Machines / Equipment
- Other manufactured goods
- Food and beverage
- Fashion, Textile
- Paper, cardboard, printing
- Chemistry
- Plastic, rubber

A double score is established for each of these 257 sectors using LOCAL SHIFT ®, the first urban economy simulator developed by UTOPIES, using the following 2 indicators:

- The **sector's level of priority with regard to the area's demand**: each sector does not contribute equally to the value chain of products consumed locally. For instance, sector X might account for 20% of all production needed to satisfy local demand, while sector Y might only account for 1%. Each sector's strategic importance with regard to local demand is rated from 0 to 10 (10 being the highest centile)
- The **area's level of self-sufficiency for the sector**: the territorial entity's capacity to cover local demand for a given sector. Sector X is present locally and able to meet 10% of local demand, while sector Y also present locally satisfies 25% of local demand. Each sector is scored on a scale from 0 to 10 (0 =0% autonomy, … 10 = 100% autonomy or more).

To increase legibility across sectors, these findings are aggregated into a final score out of 100 points (an urban area scoring a 10 in terms of self-sufficiency across all 257 analyzed sectors would score 100)

Level of priority

Level of self-sufficiency	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

To achieve a high FabCity index, an area must feature a **high level of self-sufficiency across a wide range of sectors, particularly in the most strategic sectors with regard to local demand.** To reach a high level of self-sufficiency a territory must feature a diverse industrial fabric (diverse in the number of sectors as well as in how many companies operate in each given sector - displaying an industrial fabric dominated by a few big producers is not enough to make a FabCity).

Established for the year 2018, FabCity Index offers a unique overview of the manufacturing capacity of French cities, which will be updated yearly to **monitor the evolution of these cities' self-sufficiency**, both across sectors and for any given sector, and to highlight cities who successfully reindustrialize their urban fabric.

FABCITY INDEX 2018
KEY FINDINGS FOR FRENCH CITIES

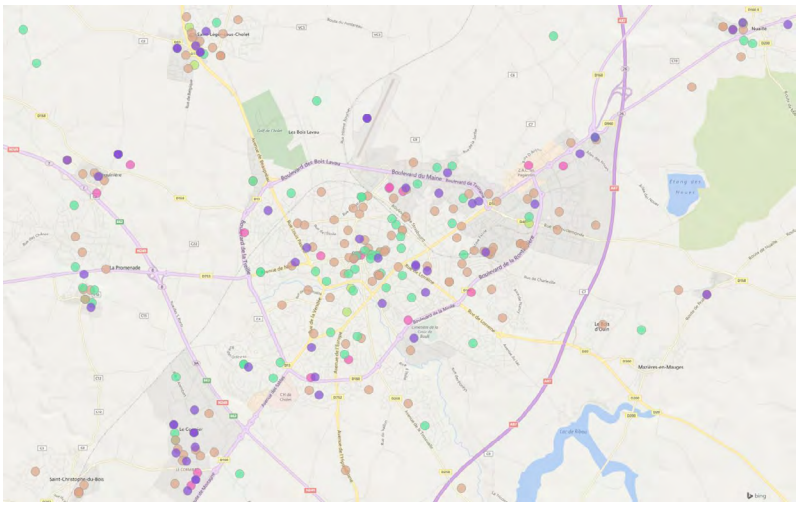
FabCity Index France 2018 demonstrates cities that have maintained a diversified local productive fabric to meet local demand (Saint Etienne, Cholet, Valence, Bourg-en-Bresse, Lorient,...)

Major urban areas naturally find their way to the top of the index, with Paris at #1 and Lyon at #2, followed by Strasbourg at #3 and Saint Etienne at #4, a remarkable score for the 17th most populated urban area in France. Many of other cities make their way to the to the top of the FabCity Index accordingly in terms of population size, such as Cholet (11th, up 73 places), Valence (15th, +35 places) and Bourg-en-Bresse (17th, +54 places), notably outperforming other similarly-sized urban areas.

A number of small urban areas also make notable leaps to the top of the FabCity Index: Chemillé (31th, +449 places), Beaupréau (42nd, + 454 places) and La Pommeraye (64th, + 430 places) - all of which are located in the vicinity of Cholet - while Noyal-Pontivy (79th, +629 places) registers the steepest upward leap.

Cholet's production model

Located within a triangle shaped by the cities of Nantes, Angers and La Roche-sur-yon, the urban area of Cholet features flagship industrial sites, SMEs, sprouting industries, family-run and cooperative production units (142 manufacturing SMEs - excluding bakeries). Cholet's urban area includes a wide variety of manufacturing activities, a significant proportion of which is able to meet local demand.



- Food and Beverages
- Manufacture of final products
- Machinery and equipment (including Automotive)
- Raw materials
- Pharmacy and Chemistry

Fab City Index France: TOP 30

Urban Area	Fab City Index Ranking	Population Ranking	Gap
001 - Paris	1	1	0
002 - Lyon	2	2	0
009 - Strasbourg	3	9	6
017 - Saint-Étienne	4	17	13
005 - Lille	5	5	0
008 - Nantes	6	8	2
003 - Marseille - Aix-en-Provence	7	3	-4
011 - Rennes	8	11	3
016 - Avignon	9	16	7
006 - Bordeaux	10	6	-4
084 - Cholet	11	84	73
004 - Toulouse	12	4	-8
021 - Orléans	13	21	8
010 - Grenoble	14	10	-4
050 - Valence	15	50	35

Urban Area	Fab City Index Ranking	Population Ranking	Gap
012 - Rouen	16	12	-4
071 - Bourg-en-Bresse	17	71	54
023 - Angers	18	23	5
025 - Dijon	19	25	6
007 - Nice	20	7	-13
043 - Lorient	21	43	22
051 - Saint-Brieuc	22	51	29
022 - Caen	23	22	-1
036 - Bayonne	24	36	12
019 - Clermont-Ferrand	25	19	-6
104 - Rodez	26	104	78
081 - Roanne	27	81	54
046 - Saint-Nazaire	28	46	18
045 - Chambéry	29	45	16
027 - Béthune	30	27	-3

It appears that approximately 30 out of the 50 most populated cities in France clearly underperform compared with similarly-populated urban areas; there are also drops in their FabCity Index ranking compared with their ranking in the City-Population Size Index.

Significant things to notice; a few major metropolitan areas such as Nice or Montpellier did not make it into the Top 50 FabCity Index. Many cities from France's historically industrial North-Eastern quarter did not make it either (Lens, Valenciennes, Amiens, Metz, Nancy, Reims, Troyes, ...), nor did a number of port cities (Brest, Dunkerque, Le Havre, Toulon). Out of the 50 largest urban areas in France, Poitiers is the city that underperforms the most drastically, Ranking 150th on the FabCity Index, down 111 places from its ranking in terms of population size.

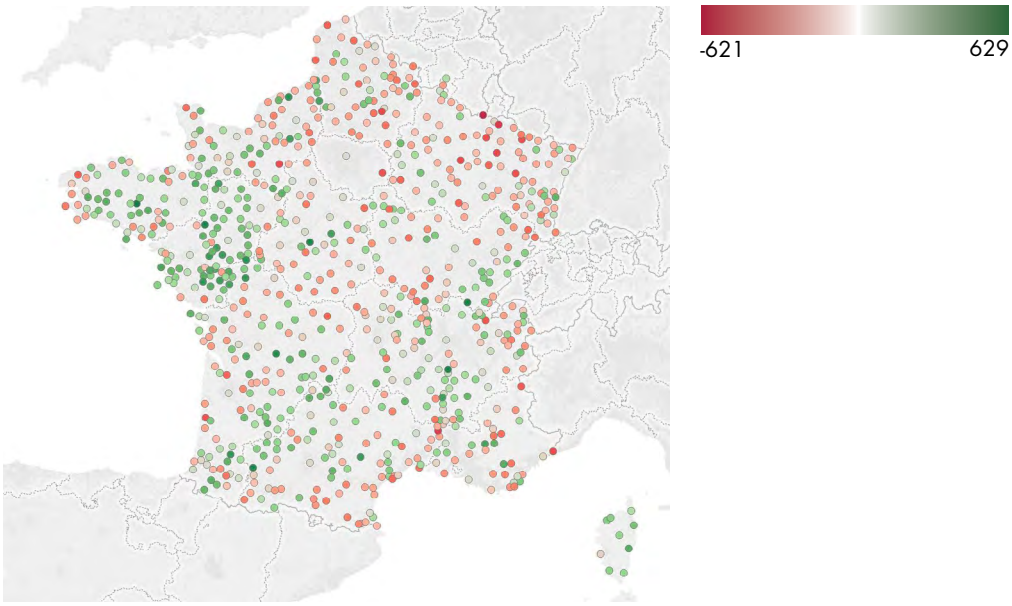
A few cities from the Moselle and Meurthe-et-Moselle regions of Eastern France feature low FabCity Index ratings that appear disconnected from their size, a phenomenon which concerns cities located close to the border: Longwy (-621 places), Thionville (-521), Bar-le-Duc (-453), Saint-Avold (-438) or Lunéville (-435).

Fab City Index France: Underperforming cities

Urban Area	Population Ranking	Fab City Index Ranking	Gap
007 - Nice	20	7	-13
013 - Toulon	52	13	-39
014 - Douai - Lens	51	14	-37
015 - Montpellier	68	15	-53
018 - Tours	34	18	-16
020 - Nancy	73	20	-53
024 - Metz	106	24	-82
026 - Valenciennes	126	26	-100
029 - Reims	76	29	-47
030 - Brest	63	30	-33
032 - Le Havre	123	32	-91
034 - Mulhouse	88	34	-54
035 - Limoges	55	35	-20
038 - Dunkerque	78	38	-40
039 - Poitiers	150	39	-111
040 - Nîmes	138	40	-98
048 - Troyes	117	48	-69

The gap between the FabCity Index and the City-Population Size Index

Analyzing the performance of urban areas with regard to their population size highlights a higher density of locally productive cities in the Pays de la Loire region (particularly in Vendée) as well as in Bretagne, the Drôme valley, etc. Urban areas in the North-Eastern region of the country feature a much lower capacity for self-sufficiency, which is also the case for very residential urban areas (close to the border) or urban areas with atypical economies (depending entirely on a given industrial site, port cities, seaside or skiing resorts, etc.).



Fab City Index France scores are a reflection of historical specializations of cities on a limited range of sectors.

Few urban areas do well on the FabCity Index over more than just a couple of industries. A notable exception is Saint-Etienne (3rd for metal industries, 6th in both the food-beverage and paper-cardboard-printing industries, 7th in other manufactured goods, 12th in forestry and woodwork, 13th in the machine-equipment sector, ...), as well as Cholet, which appears 4 times in one sector's top 5 cities (metal industry, other manufactured goods, textiles, plastic industry).

	N°1	N°2	N°3	N°4	N°5
Agriculture, fishing industry	016 - Avignon	011 - Rennes	023 - Angers	140 - Villeneuve-sur-Lot	324 - Saint-Pol-de-Léon
Extractive industries	016 - Avignon	002 - Lyon	162 - Cahors	107 - Châlons-en-Champagne	079 - Agen
Forestry, woodwork	006 - Bordeaux	308 - Ussel	336 - Châtillon-sur-Seine	145 - Saint-Dié-des-Vosges	009 - Strasbourg
Mineral construction materials	001 - Paris	002 - Lyon	003 - Marseille - Aix-en-Provence	010 - Grenoble	016 - Avignon
Metal industry	001 - Paris	002 - Lyon	017 - Saint-Étienne	004 - Toulouse	084 - Cholet
Machines / Equipment	001 - Paris	002 - Lyon	010 - Grenoble	009 - Strasbourg	050 - Valence
Other manufactured goods	001 - Paris	002 - Lyon	008 - Nantes	084 - Cholet	005 - Lille
Food and beverage	001 - Paris	009 - Strasbourg	011 - Rennes	043 - Lorient	071 - Bourg-en-Bresse
Fashion, Textile	496 - Beaupréau	549 - Ernée	480 - Chemillé	084 - Cholet	001 - Paris
Paper, cardboard, printing	001 - Paris	005 - Lille	002 - Lyon	010 - Grenoble	012 - Rouen
Chemistry	002 - Lyon	001 - Paris	005 - Lille	012 - Rouen	003 - Marseille - Aix-en-Provence
Plastic, rubber	084 - Cholet	165 - Oyonnax	002 - Lyon	001 - Paris	434 - Sainte-Sigolène

In the vast majority of cases, French cities' self-sufficiency score is achieved by performing well in one or 2 prominent industries which are historically established in the area, rather than achieving good scores across a variety of sectors...

French urban areas are not very locally productive and depend highly on external extraction and production centers.

Beyond highlighting contrasting production capacities of French cities, the FabCity Index reveals an overall low level of productive self-sufficiency for most French cities. Indeed, out of a theoretical score of 100 points (maximum self-sufficiency across all sectors), not a single city scores higher than 40 points, and 95% of them score below 10 points. In other words, the FabCity index proves that the dependency of French cities on externally produced goods remains very high.

To get a clearer picture of the situation, it is possible to assess the ratio of local production within the entirety of production necessary (finished /semi-finished products, raw materials...) to manufacture all the goods consumed (food, manufactured goods) by an urban area's population: out of €100 of goods consumed locally (excluding distributors' sales margin), how much is derived from local production?

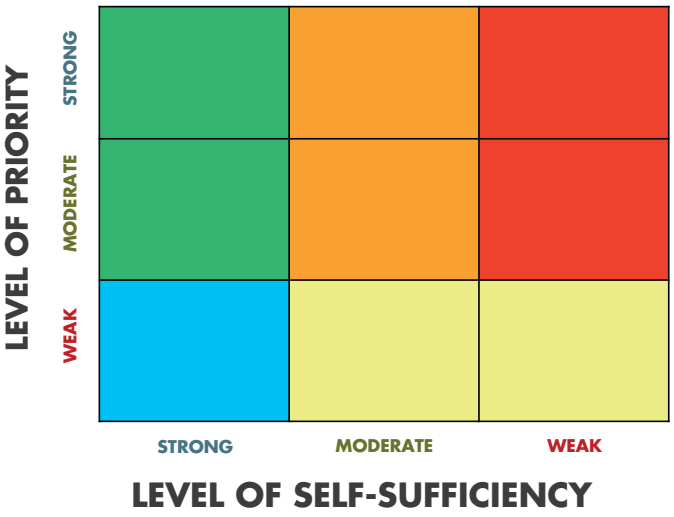
In a year, the entire production cycle for goods consumed by local households is equivalent to a production value of €2,500/inhabitant on average (ranging from €1,700 at minimum to a maximum of €4,100). Paris' urban area (known as Ile-de-France) is able to capture €280 per year per inhabitant while other urban areas in France only capture €80.
In other words, on average, a French city only produces about 3,1% (or just €3 out of every €100) of goods consumed by its population. Unsurprisingly, Paris (8,7%) and Lyon (8,4%) are the urban areas in France which feature the highest level of self-sufficiency.

An urban area operating at a 3% rate of autonomy and aiming to increase this rate to 10% – a reasonable and fairly accessible (first) goal – would need to generate an added €175 worth of locally produced goods dedicated exclusively to local consumption per year and per inhabitant.

Urban Area	Fab City Index	Level of self-sufficiency
001 - Paris	37,58	8,7%
002 - Lyon	34,30	8,5%
009 - Strasbourg	21,61	6,1%
017 - Saint-Étienne	18,83	4,9%
005 - Lille	18,37	5,0%
008 - Nantes	18,28	5,0%
003 - Marseille - Aix-en-Provence	17,65	4,6%
011 - Rennes	17,30	6,6%
016 - Avignon	16,79	6,2%
006 - Bordeaux	16,22	4,5%
084 - Cholet	15,91	6,0%
004 - Toulouse	15,86	3,8%
021 - Orléans	15,58	5,3%
010 - Grenoble	15,50	3,8%
050 - Valence	13,46	4,5%
012 - Rouen	12,88	4,7%
071 - Bourg-en-Bresse	12,70	4,4%
023 - Angers	12,53	4,8%
025 - Dijon	12,39	4,9%
007 - Nice	12,30	5,0%
043 - Lorient	12,12	4,4%
051 - Saint-Brieuc	11,50	4,6%
022 - Caen	11,46	4,5%
036 - Bayonne	11,18	4,3%
019 - Clermont-Ferrand	11,15	5,3%
104 - Rodez	10,94	4,2%
081 - Roanne	10,90	4,6%
046 - Saint-Nazaire	10,83	4,0%
045 - Chambéry	10,78	4,2%
027 - Béthune	10,63	3,7%
480 - Chemillé	10,41	4,6%
028 - Le Mans	10,39	3,8%
042 - Pau	10,39	4,0%
018 - Tours	10,32	4,3%
079 - Agen	10,31	5,3%
118 - Romans-sur-Isère	10,09	4,6%
066 - Quimper	9,93	4,8%
031 - Perpignan	9,64	3,7%
041 - Besançon	9,50	3,9%
055 - Vannes	9,38	3,9%
139 - Aubenas	9,28	4,0%
496 - Beaupréau	9,17	4,5%
140 - Villeneuve-sur-Lot	9,14	3,6%
088 - Mâcon	9,13	4,2%
047 - La Rochelle	9,10	3,9%
149 - Louviers	9,06	5,5%
033 - Amiens	9,05	2,8%
211 - Thouars	8,88	3,8%
085 - Brive-la-Gaillarde	8,77	4,2%
195 - Sablé-sur-Sarthe	8,69	4,4%

WHICH SECTORS SHOULD BE A PRIORITY FOR URBAN MANUFACTURING INITIATIVES?

By setting a sector's local level of priority (i.e. its significance in terms of potential) against its level of self-sufficiency (i.e. the extent to which the sector's local production is able to meet local demand), we can identify sectorial priorities for any given city.



About **40 sectors stand out as strategic priorities** upon analysis of the 50 largest urban areas in France (see the red areas on the adjacent map). The development of these locally under-represented sectors holds great potential for improving the city's resilience, employment rate and agility. The key to developing sectors is to **foster alternative production models which are locally anchored and sustainable.**

Food and beverage
- Cheese, yoghurt and butter processing
- Production of mineral water and non-alcoholic beverages
- Meat products processing (except poultry)
- Poultry processing
- Production of snack foods

Agriculture
- Production of grain, rice, legume and oilseed crops
- Fruit culture
- Culture of other crops (sugarcane, spices, aromatic plants, etc.)
- Porcine, ovine, equine farming and aquaculture
- Cattle farming, including feedlots
- Farming of dairy cattle and dairy production

Extractive industries
- Oil and gas extraction

Fashion - textiles
- Fabric production
- Garment manufacturing
- Shoe and leather goods manufacturing

Metal industry
- Machining units
- Manufacturing and stamping of steel packaging
- Manufacturing of metal plates and structures

Plastic, rubber
- Tire manufacturing
- Plastic packaging manufacturing
- Manufacturing of other plastic products (miscellaneous)

Other manufactured goods
- Manufacturing of jewelry, bijouterie and related articles
- Manufacturing of ophthalmology products (eyewear, contact lenses, etc.)

Chemistry
- Drug manufacturing and
- Cosmetics and toiletries manufacturing
- Oil refinery
- Production of other non-organic chemical products (including nuclear fuels)
- Production of other basic organic chemical products

Machines / equipment
- Manufacturing of audio and video equipment
- Car manufacturing
- Manufacturing of car seats and interior embellishments
- Manufacturing other car parts
- Manufacturing machines to produce semi-conductors
- Manufacturing turbines and generators
- Manufacturing circuit boards (electronic assembly)

A FEW TRENDS WITHIN URBAN SMALL-SCALE MANUFACTURING

Small-scale manufacturing is an umbrella term that refers to all types of small businesses that produce tangible goods. This includes textiles, hardware, woodworking, metalworking, and 3Dprinting. It also includes hardware prototyping, consumer product design and prototyping, breweries and distilleries, and local food production and packaging. (Source: Recast City)

The small-scale manufacturing revolution is led by different types of urban production units, each with different modalities:

• **Traditional craftsmanship, neo-craftsmanship or cooperatives perpetuating local savoir-faire in short distribution circuits:** this trend typically concerns the emergence of small companies using small equipment to produce household goods distributed over a variety of channels including shops, online, pop-up stores, fairs and markets. These are essentially small value-driven labors of love which are increasingly taken on by people in search of new, more meaningful careers. Known as neo-artisans, they strive to bring together tradition and modernity in their employ as butchers, woodworkers, tailors, cheesemakers… Today, over 30% of new artisans come from other previous lines of work.

• **Manufacturing SMEs and medium-sized companies (such as prototype development companies and subcontractors):** though they hold great potential for creating new locally-anchored economic dynamics (« produce local/consume local »), in particular due to their greater agility in adjusting their production to meet specific consumer needs, these players are often missing from "innovative" production ecosystems and communication channels. For such SMEs and mid-sized companies, engaging with local markets can be an opportunity to diversify their production and find alternatives to working as subcontractors (and therefore limit their dependency on one or more big accounts) as well as create partnerships with local start-ups, in particular by making under-used production facilities available to them.

// Foodtech / SME partnerships: the case of French start-up Ici&Là

Lyon-based food start-up Ici&Là has set out to offer innovative through tasty alternatives to meat made from French-grown organic legumes. In 2016, Ici&Là launched a line of products designed for the mainstream under the brand « Le Boucher Vert », which included vegetarian meatballs, steaks and nuggets made from lentils, chickpeas or flageolet beans. Having tested the market, Ici&Là invested in machines which were set up in the facilities of an industrial partner specializing in the production of frozen fruit and vegetables in the nearby Drôme region. This smart partnership allowed Ici&Là to launch an industrial production line without having to set up its own factory, simply by making use of unused workspace in its partner's facilities and providing its knowhow and adequate training to the facilities' operators.

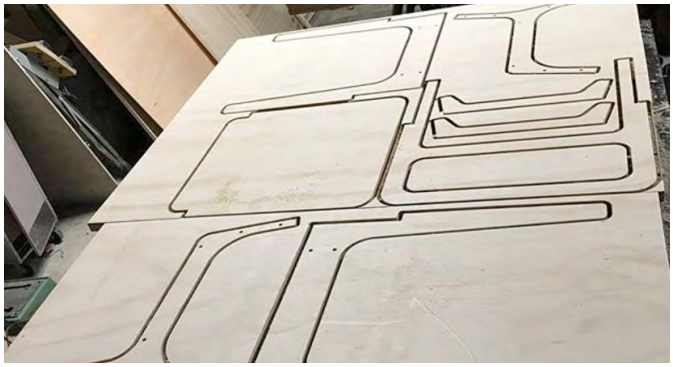
OPEN MANUFACTURING LABS:

- These labs empower people to design and create objects by offering free access to digital 3D printers with competent personnel to assist in operating them, allowing entrepreneurs, designers, artists, students, hackers or any citizen to easily and swiftly get any idea for an object made into a prototype and if the prototype is conclusive, to move on to the development stage.
- Such labs are often set in wider « living-fabs » projects, naturally bringing together a network of manufacturing initiatives, creating innovative ecosystems which are fertile grounds for unique manufacturing experiments (shared, distributed): for instance, Maker Mile (London), Brigades (Riga), Fabrication Athenaeum (Barcelona), which are themselves prototypes for manufacturing ecosystems of the future.
- Open manufacturing platforms inspired by the open-source software movement (such as Opendesk, WikiHouse or OpenStructure) constitute a whole new set of production tools which generate new manufacturing environments with a capacity to meet the demands of an increasingly globalized market while facilitating serial production and economies of scale. This « Design global, manufacture local » model (based on co-creation and open source development) allows designers/engineers to have their designs produced anywhere in the world while also offering an opportunity for micro-production units to broaden their offer and grow their business.

// OpenDesk, Open Making

Global players in the furniture industry are keeping a close eye on the development of OpenDesk's trailblazing business model, an open-source furniture platform which manufactures its products in local workshops, a true revolution in the way furniture is designed and produced which eliminates costly and time-consuming shipping, showrooms and storage. Created by international designers, OpenDesk's furniture was specifically designed to be printed with numerical control machines, which means a given item's file can be downloaded and produced locally on demand, anywhere in the world, with the help of OpenDesk's network of manufacturing partners.

www.opendesk.cc

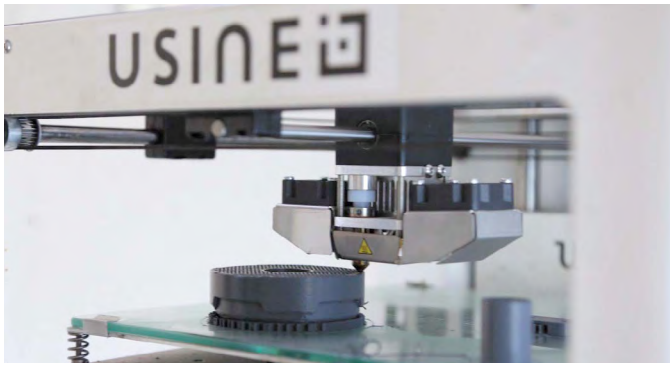


Professional or corporate Fablabs serve as incubators offering new, swifter solutions for prototyping and creating pre-series or micro-series, including interesting sectorial initiatives such as « Foodlabs » (food processing workshops which offer a pooling of tools, machines, autoclaves, labeling machines, etc. as well as qualified personnel and certification) or « textile Fablabs » dedicated to design development and the production of limited series of textile products (making professional, specialized machines available alongside textile printers, pooling raw material purchases, upcycling initiatives, sharing experience and know-how...)

// Usine IO: machines and know-how to jumpstart new products from prototype to industrialization

Based in Paris, Usine IO is a private product development accelerator featuring a hi-tech prototyping workshop dedicated to a product's pre-industrial development phase. Usine IO offers comprehensive expertise and tailored services to assist companies in developing new products step by step, from the initial idea all the way to launching production. Usine IO features over 1,500m² of workspace, 400m² of which are dedicated to wood- and metalwork, 3D printers and light metal processing machinery, between 200 and 400 m² dedicated to product design, and 500 m² of co-working space which can host up to 60 people.

www.usine.io



// Brooklyn FoodWorks: Foodlab and start-up incubator

Brooklyn FoodWorks, is a 10,000m² start-up incubator whose goal is to become a "premier platform to prototype, launch, and grow innovative food businesses." Most notably Brooklyn FoodWorks offers low-cost kitchen space, starting at 300$/month for unlimited 24/7 access to facilities along with personalized business mentoring. More than 120 entrepreneurs currently benefit from Brooklyn Foodworks services, and over 400 new products have been launched with the support of this platform since its inception, including such products as ZEST Y, POP PASTA or MALAI ICE CREAM.

www.thebrooklynfoodworks.com
www.youtube.com/watch?v=k1bZe9pYq2k

Local micro factories: These are closed or shared production units with a capacity to manufacture small or medium-sized goods in limited series (a few hundred copies) focused on meeting local demand: food, beverage, textiles, leather goods, furniture, household equipment… These micro factories come in a variety of formats: artisanal micro factories (which make use of traditional manufacturing processes), small production/processing labs (for instance, adjacent to a farm), manufacturing at the point of sale (fabshops) often offering tailor-made goods, assembly micro factories (which assemble finished products from spare parts received from elsewhere), nomadic micro factories, ready-made and modular factory kits (e.g. : micro-abattoirs), repair or refurbishing workshops (e.g : for electronic appliances), micro-production units (e.g : micro combined heat and power) or micro factories operating on new digital production models (such as 3D printing, digitizing or collaborative robotics offering a wealth of new possibilities). Not only are micro factories small, they tend to be integrated to more circular and inclusive economic models. To overcome the limits in local resources, micro factories often develop their own recycling (e.g : wood, cardboard, …) and reuse initiatives (e.g : making use of unsold food products) or other forms of closed circuit production (e.g : making bottles from recycled glass collected from customers).

// BAPBAP (« Brassée à Paris, Bue à Paris », i.e. “Brewed in Paris, Consumed in Paris”): a microbrewery in the heart of Paris

From malt milling to bottling, every step of the brewing process is performed locally at BAPBAP, a Parisian micro-brewery located in an old textile accessory warehouse in the 11th arrondissement of the French capital. BAPBAP is a unique space spread over 1800m^2 : the 4th floor and attic serve as storage space for packaging material, the 3rd floor features the malt mill and silos, storage space for grains and dry matter; the 2nd floor is devoted to tastings and “beerology” training (100m^2) and also hosts BAPBAP’s office and coworking spaces; the 1st floor features a walkway overlooking the brewing hall and fermenters on the ground floor, which also features BAPBAP’s brewery lab and welcome desk; in the basement beers are conditioned in bottles or casks and stored in warm rooms. Finally, beers are commercialized in BAPBAP’s adjacent store as well as online and in a network of liquor retailers, restaurants, bars, grocery stores and food stores across the city.

www.bapbap.paris

// Unto This Last: The Workshop in the City

Unto This Last is essentially a furniture manufacturing workshop located in the heart of London offering tailor-made furniture that can be customized on demand. Located in Shore ditch, Unto This Last feature an open workshop at the back of the shop where everyone is welcome to observe the manufacturing process. Olivier Geoffroy came up with this idea as a reaction to the increasing prevalence of outsourced and mass-produced furniture, seeking to offer a new kind of experience to furniture buyers who can witness and take part in the manufacturing of their furniture, as well as perpetuate traditional English know-how.

www.untothislast.co.uk

// Local Motors: cars manufactured in local micro factories

Now let's take a look at a completely different sector: in the automobile industry such a local business model may seem impossible to implement considering the complex decision-making processes and vast number of powerful industrial players involved in a car's production. However, Local Motors, a car producer founded in Arizona in 2007, has successfully set out to challenge this notion. The company's business model is focused on small, tailored series designed from open-source platforms and built in micro factories across 5 cities (Phoenix- Arizona, Knoxville- Tennessee, Las Vegas-Nevada, National Harbor-Maryland, and Berlin- Germany). 2 years are all they need to develop a new car model (as opposed to 3 years in the classical industrial model), thanks to the contribution of some 50,000 collaborators participating in their co-design platform, the use of serial parts (an increasing number of which can be 3D printed) and mostly, thanks to decentralized production. And all this for under $50,000.

localmotors.com

WHICH STRATEGIES TOWARD PRODUCTIVE CITIES?

As a result of globalization, the distance separating producers from consumers has reached an unprecedented scale in many industries. However, a growing awareness of the limits and inherent vulnerability of this globalized model has spawned a worldwide movement to reintegrate industrial production into urban areas to bridge the gap between producers and consumers and stimulate innovation. Various terms have sprouted to refer to this phenomenon - « Maker City », « Fab City », «Productive City », « Small-scale manufacturing » - terminologies which all refer to the same core ideas: harnessing new digital production technologies for design/prototyping/manufacturing, expanding local and global collaborative economy initiatives, DIY approaches whereby professionals as well as amateurs take manufacturing into their own hands, a growing awareness of natural resource depletion and the low resilience of cities… This trend is manifested in the emergence of new spaces - fablabs, makerspaces, co-working spaces - dedicated to bringing together innovators, designers and manufacturers to share experience, tools and know-how. Such collaborative spaces are also sprouting within manufacturing SMEs and medium-sized companies themselves.

Building productive cities with a capacity to meet a significant percentage of their own demand is a huge challenge. How can we generate more initiatives to this effect? How can we create connections between existing initiatives? How can we increase small-scale manufacturing to reach production levels that actually make a difference? How can we effectively connect small-scale manufacturing with local consumers?

The answers to these challenges lie in the exploration of a variety of strategic issues such as:

Getting to know the pioneers of small-scale urban manufacturing

Manufacturing with local resources to meet local demand while making good use of global know-how and innovations is a challenge which calls for new entrepreneurial models. Understanding the specificities of urban manufacturing projects is a prerequisite:

- What exactly are micro factories and small-scale urban manufacturing?
- Who are the entrepreneurs who are trailblazing these new models?
- What technical choices are they making? Which economic models are they embracing?
- What kind of products are they manufacturing, in which industries?
- What are key factors of their success and what are their difficulties?
- What are their needs in terms of know-how, access and expertise, with regard to production tools, or funding…?

// "Made by": meeting micro-manufacturers in the city of Memphis and Shelby County

Made By is a unique initiative aimed primarily at understanding the realities of makers, artisans and micro-manufacturers in the city of Memphis and Shelby County: who are they, what are their aspirations, their habits, their methods, their work environments, their local economic impacts? This inquiry led to identifying a typology of local micro-producers and establishing the foundations for a local development plan aimed at increasing the proportion of more "robust" micro-manufacturers within the community, i.e. entrepreneurs focused on management, development and growth rather than just conception/production.

See the report online:
www.madebyproject.org/about-us/

Defining priorities for fab cities

Whether or not they have a history or an existing fabric of industrial production, cities represent a wellspring of manufacturing potential considering the high demand they generate - local demand often exceeds hundreds of millions of dollars-worth of goods. Better meeting this demand could allow for the creation of hundreds, even thousands of jobs in every city. Among the many local niches waiting to be claimed by entrepreneurs, here are a few questions to help identify which ones hold the greatest potential:

- Which are the most strategic manufacturing sectors with regard to local demand?
- Which local markets hold the greatest potential for generating activity and employment?
- What are the environmental impacts associated with these markets, in particular concerning carbon footprint, natural resource and water consumption?
- For which products or industries does the city feature existing resources (existing industrial fabric, know-how, infrastructures, raw materials, etc.)?

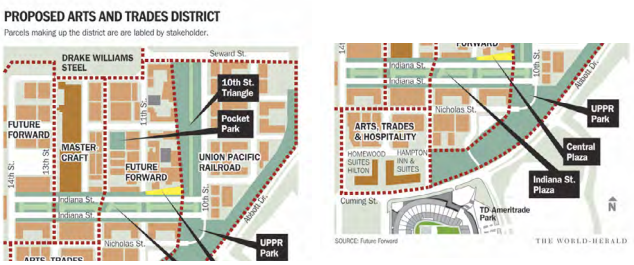
Integrating manufacturing to urban redevelopment strategies

Devitalization of city centers is a much-discussed reality for a great number of cities across France, yet urban redevelopment strategies barely ever include small-scale manufacturing, focusing instead on developing commercial activity, housing or office space. However, most small-scale manufacturers run production operations which can easily be inserted in ordinary urban fabric, using compact manufacturing tools which generate less nuisance (noise, pollution, freight flow…), combining manufacturing and commercial space, for instance with the front of shop operating as a point of sale for goods manufactured at the back. Moreover, small-scale manufacturers can contribute to the regeneration of urban centers by attracting a new flow of urban dwellers and visitors, while also becoming ambassadors to the city, successfully producing and selling products that promote the city.

- In what kind of spaces do micro-manufacturing projects tend to get set up?
- What are their specific needs?
- How to anticipate and foster the establishment of small-scale manufacturing in urban planning?

// Omaha's "Makers district"

In 2017 the city of Omaha (Nebraska) created a "makers district" to optimize land use, zoning, building design and coordinate infrastructure investments to attract and retain small-scale manufacturers in a specific area of the city.



// Brick City Makes, " the Hub for growing manufacturers"

St. Louis-based real estate developer DeSales has acquired an old industrial building in the Fox Park district of St. Louis and transformed it into « Brick City Makes », a hub for growing manufacturers which offers low-cost workspaces for local makers in partnership with the city of Saint Louis and two not-for-profit organizations.

CULTIVATING CONNECTIONS BETWEEN DIFFERENT KINDS OF MAKERS

Manufacturing the products we use in our daily lives relies on complex and increasingly scattered supply chains, from design to development, from sourcing of materials to producing components… Finding people with the right kind of expertise for any segment of the production process can prove a real challenge, this is why a key factor of success in increasing a city's capacity for self-sufficiency is the cultivation of connections between a wide variety of local makers who are often unaware of the full range of locally-available resources and know-how. Such local collaborations can expand vertically in the form of new production chains – food, textiles, energy, etc. – as well as horizontally through pooling of resources – production tools, innovation, human resources, etc. This collaborative dimension will benefit the new generation of local makers as much as more established global corporations which are also interested in relocating manufacturing in closer proximity to consumers.

- Which manufacturing resources are available in the city (design resources, industrial production resources, prototyping, existing production or assembly lines, logistics infrastructures, etc.)?
- Where are there opportunities for pooling of production tools, connections and manufacturing agility to allow local start-ups, SMEs and artisans to locally produce small and medium-sized series?
- How can we guarantee that industrial know-how gets passed on from established industrial players to the newer generation of makers?
- Which collaborations between companies could lead to establishing circular economy circuits, or local electricity production, urban agriculture, etc.?

MANUFACTURING WITH LESS RESOURCES

The production of manufactured goods requires the extraction and transformation of natural resources – fossil fuels, metals, biomass, etc. – and is therefore at the heart or today's major environmental challenges. The most widely accepted scenario for decades to come is one of increasing rarefaction of a growing number of natural resources which are vital to the economy. Hence optimal resource management is crucial in minimizing production costs, moreover the ability to develop low material-footprint goods will be a determining success factor in the markets of tomorrow. Resource management raises a number of challenges and opportunities for productive cities of the future.

- Which local industries are particularly sensitive to resource depletion? Which raw materials are most critically depleted?
- Which inspiring manufacturing models (economic models, technologies, organizational systems, etc.) could optimize a product's entire lifecycle? Which products combine commercial success with low material footprint?
- How can new economic models which make use of renewable resources be established in cities (recycling, remanufacturing, reemployment, renewable energies…)?

Local manufacturing: a matter of resilience

The strong dependency of local demand on foreign imports exposes cities to risks connected with global market fluctuation. This economic dependency also comes with a significant and largely ignored environmental footprint. Each import flow implies a « material footprint »: fossil fuels, metals, non-metallic minerals, biomass, etc… It must be emphasized that these environmental impacts are generated all along the supply chain of imported products[2]: raw material extraction, transformation, assembly, transportation, etc. This is why measuring the weight of an imported car upon crossing a border does not account for a large part of its material footprint: its manufacturing and transportation have required a significant flow of material which is not incorporated in the end-product. Such « hidden material flows » are particularly high for manufactured products. In the present context of increasingly globalized supply chains, environmental impacts associated with imports can be delocalized in foreign locations far-removed from importing countries where these products are consumed.

Example of the annual household consumption material footprint of Nantes Métropole

Each year, the extraction of nearly 9.3 million tonnes of raw materials (fossil, mineral, animal and vegetable resources) is necessary for the production of goods and services consumed by Nantes households, i.e. approximately 15 tonnes per year and per inhabitant. A very large majority of these resources (85%) are extracted outside France (7.9 million tonnes per year).

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Source : LOCAL FOOTPRINT ® Nature / UTOPIES
>> Plaquette LOCAL FOOTPRINT NATURE 2018

Locations of impact	Material footprint [tonnes]
France	1 368 824
Abroad	7 902 128
Total	**9 270 951**
Total / inhab	15
% Abroad	85%

Raising awareness around small-scale manufacturing and rallying inhabitants for a cause.

Increasing a city's self-sufficiency requires the development of local small-scale manufacturing, however this can only be successful if locally-produced goods meet local demands. Indeed, creating a local offer is not a guarantee that local inhabitants will consume it. For this reason, increasing visibility of locally-produced goods and promoting them is a key success factor. This requires awareness-raising campaigns about locally-manufactured goods, shining a light on the darker realities of the globalized production chains of locally-consumed products. Showcasing local manufacturing can also inspire locals to get involved with local manufacturing themselves, an attitude which is indispensable to generate the kind of momentum needed to bring about a city's transformation into a locally productive urban area.

- What is the reality of the supply chain of products consumed by locals?
- Which products are manufactured locally?
- How to develop labels and distribution channels to better identify and circulate locally-manufactured products?
- How to build, share and debate new representations surrounding small-scale urban manufacturing and create new appealing storytelling to rally inhabitants to this cause?
- How to create community and elicit collaborations between professionals (industrials, entrepreneurs, academics, researchers…) and civil society (not-for-profits, locals)?

02 : See International Ressource Panel – Global material flows and ressource productivity – United Nations Environment Programme (UNEP), 2016

// Knoxville, « The Maker City »

In 2016, the mayor of Knoxville (Tennessee) created a special council dedicated to « local production » (made up of 15 advisers) aimed at sparking a vision for a « maker community » within the Knoxville urban area and create conditions for creative entrepreneurs to have a say in local regulations. This council brings together artisans, artists and small local manufacturers and has launched a number of initiatives such as a « Maker City Summit » aimed at connecting local makers, workshops and training programs, the creation of the « Maker City » local brand, and a partnership with internet peer-to-peer retail giant Etsy to support local small-scale manufacturers.

www.themakercity.org

THE MAKER CITY KNOXVILLE™

THE FABCITY APPROACH: BARCELONA'S EXAMPLE

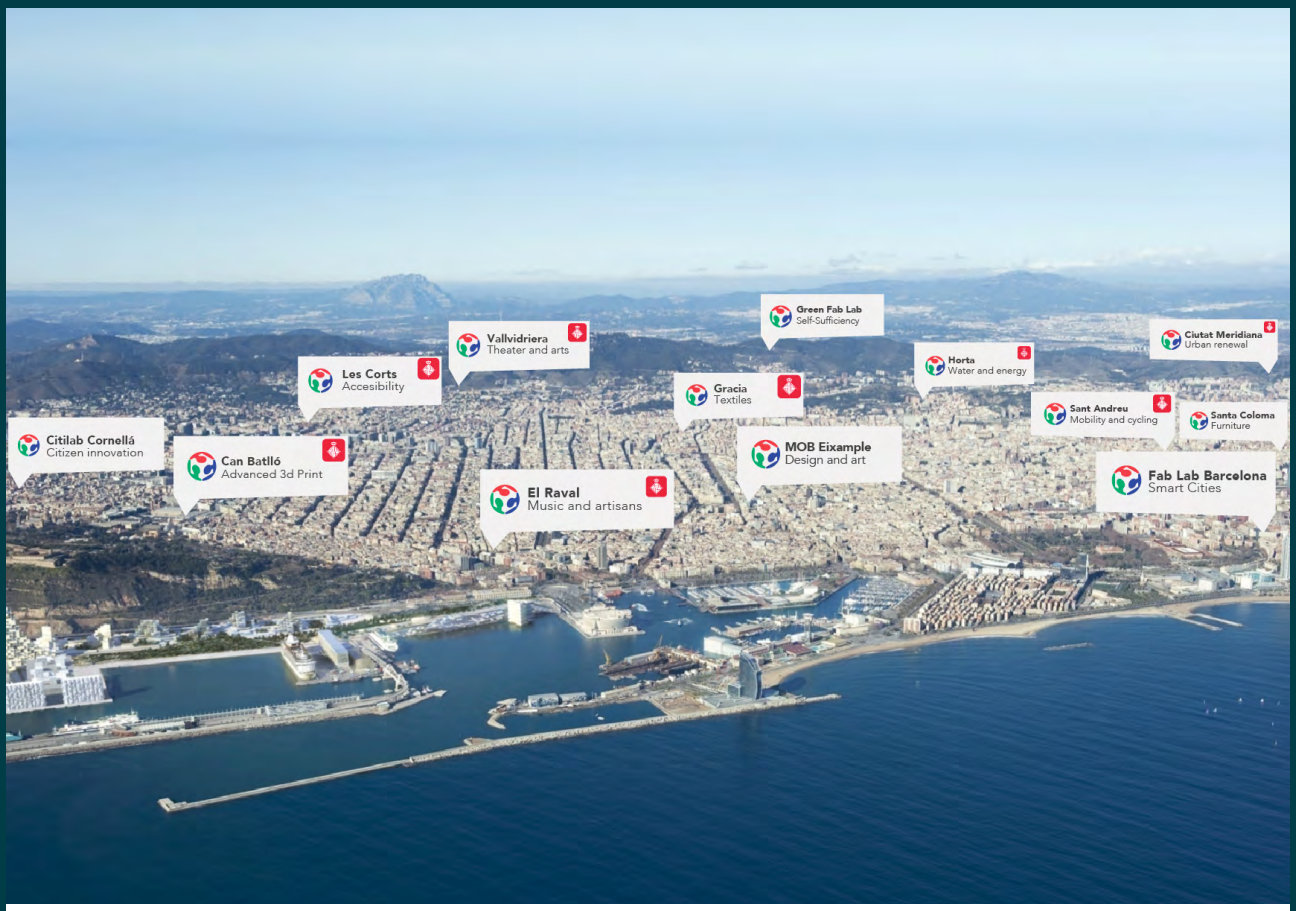
The first edition of the Fab City Summit was held in Barcelona in the summer of 2014, bringing together civic leaders from all over the world committed to the Fab City Barcelona pledge - a countdown for cities to become self-sufficient by 2054. Joined by a variety of urbanists, makers and innovators with a shared desire to reinvent city models, a series of common goals were outlined in the event's white paper: relocating manufacturing within cities, establishing more circular production models and harnessing the potential of new digital technology to effect this transformation.

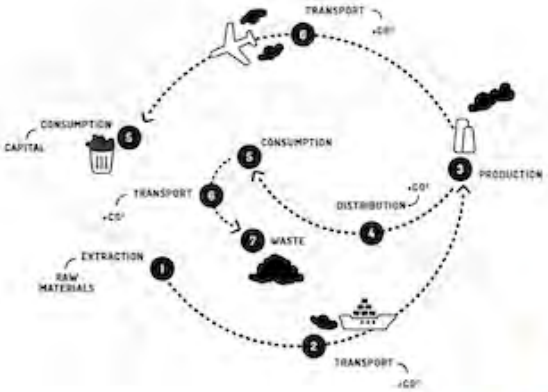
Established by a wide variety of stakeholders involved in the current movement to make cities more locally productive (fablabs, makerspaces, schools, public and private institutions), the Fab City project starts with gathering knowledge on how a city operates to effectively generate a new manufacturing ecosystem which empowers citizens to lead the transformation of their cities with these new means of innovation and production.

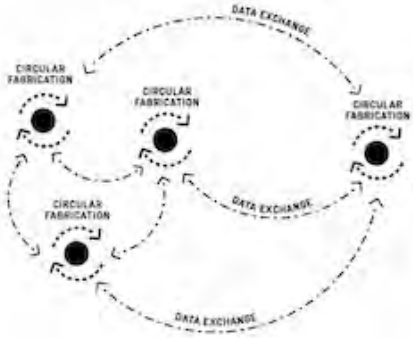
In Barcelona, the IAAC (Institute for Advanced Architecture of Catalonia[3]) has been mandated by the city to develop and coordinate the ecosystem of public and private players (such as "Fabrication Athenaeums of Barcelona") involved in achieving the Fab City agenda through a number of local initiatives. Starting as early as 2010, a variety of local initiatives have raised awareness amongst citizens, entrepreneurs and public institutions about this momentous urban transformation, such as SmartCitizen[4] (an OpenSource air quality data collecting and monitoring initiative), SuperBlocks[5] (an experiment in altering the city's metabolism by restricting traffic to a few big roads and turning secondary streets into "citizen spaces" for culture, leisure and community) or more recently ROMI[6] (an open and lightweight platform for microfarms), Distributed Design Market Platform (dedicated to promoting better, more widespread use of OpenSource 3D printing through a specific platform dedicated to sharing best practices for design, production and distribution of locally manufactured goods) and finally Circular Metropolis/REFLOW, an initiative dedicated to establishing strategies to implement circular economy models, moving from a PITO model (Produce in Trash Out) toward a DIDO model (Data In Data Out).

In the spirit of Fab City's motto "Locally productive, globally connected cities", Barcelona's trailblazing experiments are anchored in neighborhood-specific protocols while sharing their results and experience globally via the Fab City network for over 10 years now, increasingly gaining international attention from cities and innovators worldwide.

03 : https://iaac.net/
04 : https://smartcitizen.me/
05 : https://www.theguardian.com/cities/2016/may/17/superblocks-rescue-barcelona-spain-plan-give-streets-back-residents
06 : https://iaac.net/iaac/european-projects/romi-robotics-microfarms/







from **PITO**

Product In → Trash Out

to **DIDO**

Data In → Data Out

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www.utopies.com / fabcity.paris