Phase de présélection

Les documents A, B et C sont construits selon la logique suivante :

- document A : présentation administrative
- document B : présentation de l'Initiative d'excellence (ambition, actions, organisation, moyens)
- document C : plan pluriannuel de financement de l'Initiative d'excellence dans le cadre de l'action globale de l'institution ou du groupement porteur de l'Idex.

Acronyme du projet d'Idex / Acronym of the project	**HLSC**
Titre du projet en français	***homo sanus in urbe sana***
Project title in English	**Towards healthy lives in sustainable cities**
Personne en charge de la coordination du projet/ Project manager	Nom / Name : Bernard Saint-Girons Coordonnées: 01.64.15.32.90
Institution portant le projet (le porteur)/ Institution leading the project (Project leader)	Nom / Name : PRES UPE
Dotation en capital demandée (a)/ Capital grant requested (a)	**442 M€**

(a) voir le règlement relatif aux modalités d'attribution des aides au titre de l'appel à projets Initiatives d'excellence (§ 4.1)

Composition du groupement constituant l'Idex /Structure of the Idex partnership

Etablissements d'enseignement supérieur et de recherche	Organismes de recherche	Autres
ENPC	IFSTTAR	ANSES
ESIEE	CSTB	INVS
UPEMLV		
UPEC		
ENVA		
ESTP		
ENSG-IGN		
EIVP		

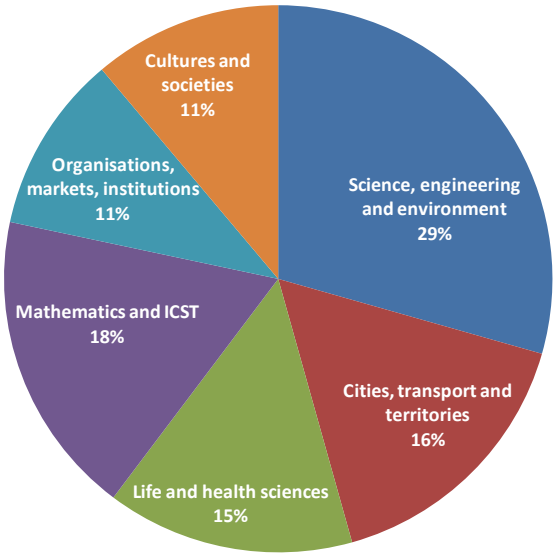
N.B. This document is 58 pages long (excluding the contents and title pages).

1. Ambition and strategy of the project

1.1. *UPE : one of the most dynamic campuses of applied sciences in France with two strong areas of focus*[1]

UPE is a **confederal university** bringing together two prestigious "grandes écoles" (ENPC and ENVA) that have enjoyed an outstanding reputation in higher education for more than 250 years; two pioneering universities (UPEC and UPEMLV) recognized for their committement to the profesionalisation of their students and deeply involved in urban development and innovation, an original grande école (ESIEE) dedicated to ITC and technology-based management, and the most prominent research center dedicated to transport, civil engineering and infrastructures in France (IFSTTAR).

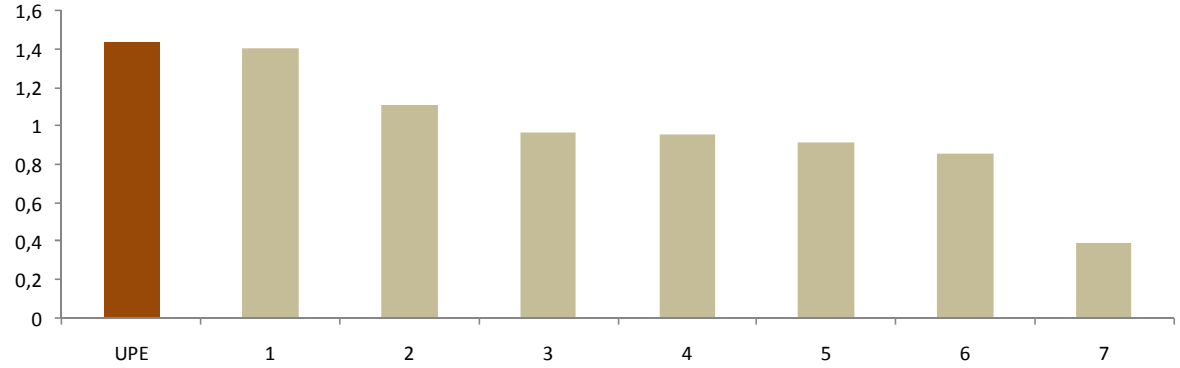
As a result, UPE gathers a research potential of **2 900 FTE including 1 600 academics**, 1 300 PhD students, 15 000 graduate students and 29 000 undergraduate students. As shown in the chart below, approximately half of its research potential is involved in science, engineering and technology, 21% in life sciences and approximately 30% in social sciences and humanities (NB: the research department Cities, transport and territories includes both social and engineering sciences).



UPE also enjoys a **significantly higher rate of publications by academic** than the national average. The chart below compares UPE (in dark brown) with the other PRES for which OST could compute this ratio.

[1] On 1. urban areas, the environment and their related engineering sciences and 2. health and society

Ratio: consolidated publications on WOS 2009 / tenured academic[2]



These institutions have progressively deepened their collaboration since 1997 based on a shared understanding of their missions:

- An interdisciplinary and systemic approach to research
- An innovative approach to education that makes us distinctive in France in lifelong learning and apprenticeship education
- A strong commitment to social and economic impact with a special focus on the professional skills of UPE students
- A pioneering role in the emerging territory of Eastern Paris where there was no HE institution as late as 1970

Since the creation of the PRES (research and HE pole) three years ago the UPE has begun a period of **transformation** and has already delivered in several significant ways:

- **A common signature for all publications** by UPE academics
- The transfer of **PhD programs** to UPE. These programs are structured around 6 graduate schools (see the domains on chart on previous page)
- **The restructuring of research** activities in **6 departments** (see chart on previous page) including mergers between existing research units across institutions (for instance in management between UPEC and UPEMLV)

Within this framework the PRES made **strategic choices in 2008** to focus its efforts and resources in research and education on two priority areas, domains in which UPE is truly excellent against international standards.

- **Cities, environment and their engineering sciences**, with a leading international cluster at the Cité Descartes, made up of several internationally recognized research teams in the fields of science, engineering and technologies as well as social sciences, including two Urban Institutes representing two-thirds of urban development students in France

[2] Source : OST (2009)

- **Health and society** with several internationally-renowned research teams based at the Mondor university hospital, world-class veterinary science at the National Veterinary School of Alfort (ENVA) and the food, environmental and occupational safety agency (ANSES) all at close proximity.

Across the two domains the UPE enjoys

- 1150 researchers (academic staff including post-docs) and 870 PhDs, approximately 80% of the total
- 18 research units which were evaluated as A or A+ by AERES.
- 118 Masters courses that were judged as A or A+ by AERES
- >10 M euros of external research projects executed annually
- 6 doctoral schools with one judged A+ by AERES and three as A, and with all judged A/A+ for scientific excellence

1.2. *UPE's ambition : be recognized as a high impact problem solving institution with an international reputation in its areas of excellence*

Since then, this choice has structured the strategy of the UPE. Consequently, UPE's project of "initiative d'excellence" is a credible, robust and ambitious acceleration of its strategy. It is a deliberate approach to build on UPE's strengths in **its two areas of focus** and exploit new interdisciplinary synergies by addressing **cross cutting issues**. As a result UPE's Labex, Equipex and IEED projects mainly **focus** on these areas.

By concentrating the efforts in these areas UPE aims to maximize the return on investment to society from investment in higher education. This **focus** will also strengthen UPE's leadership and recognition internationally. Situated in an area of high potential facing various economic and social challenges, Université Paris Est is deeply committed to **the impact imperative**. Research may be fundamental as well as finalized , education may be designed for highly talented students or students with limited academic abilities, yet UPE always tries to assemble interdisciplinary capabilities to tackle concrete and specific challenges (section 2.2). That is why UPE is strongly committed to a major **SATT** project together with the University Sorbonne Paris Cité, the CNRS, the National Institute of health and medical research (INSERM) and the Institut Pasteur.

UPE's ambition for the "Initiative d'excellence" is based on its DNA: **be recognized as a high impact problem solving institution with an international reputation within its areas of excellence**.

This ambition requires the implementation of **an innovative development model** and **new structures** to nurture excellence in the long run.

UPE's new development model consists in coordinating the efforts in research, education and expertise on tackling a few strategic socio-economic challenges within these areas of excellence. The Idex will focus on a few major challenges and elaborate strategic responses in the short, mid and long terms leveraging basic and applied research, education, training and learning and expertise. This development model requires a very strong focus of activities and resources. This will be achieved through the following levers

- An **emergence platform** to identify the key challenges on which UPE wants to focus its resources and make a distinctive contribution (section 3.1 and section 4 on governance implications)
- An interdisciplinary tool designed to help **complex systems modelling (section 3.1.)**
- **A call for proposals** to implement this strategy in **research** (section 3.2.)
- **A call for proposals** to implement this strategy in **education** (section 3.3.)
- A **foundation** to leverage partners involvements (section 4)

Section 4 describes how UPE will drive this new development model and its implications in terms of governance.

On certain fields as environmental and engineering sciences UPE is well structured notably thanks to the well established coordinating actions of ENPC and Universities as well major industrials.

Consequently UPE will foster the **consolidation of new structures** to nurture excellence in the long run and develop its attractiveness and visibility in its areas of excellence. This consolidation entails current projects already described in the previous section: top level research departments with the five *Labex* (see section 2.2.); a public-private institute on sustainable cities (IEED, see section 2.2.); active participation of UPE in the Advancity Cluster (see section 2.2.). It also encompasses *Idex* specific projects (see figure hereunder) such as:

- Constitution of highly visible education institutions within excellence areas (section 3.6.): a **UPE Health School**, a **UPE Urban Institute**, a **UPE technological** set of courses
- **Lifelong UPE**: A strong development of lifelong learning on UPE areas of excellence (section 3.7.)
- **UPE experts**: a strong boost to its expertise activity focused on UPE areas of excellence (section 3.8.)
- **UPE Equal opportunities Institute** (section 3.9.)

2. Structure and characterization of the Initiative of Excellence

2.1. *One of French most dynamic universities of finalized sciences*

2.1.1. A strong and diverse membership of world-class research and HE institutions

The Université Paris-Est (UPE) is a model within France for globally attractive 21st century universities bringing together multidisciplinary research and training across sciences and technologies oriented towards economical sectors, public and private.

The core members of the UPE constitute a rich and complementary mix of two historic *"grandes écoles"*, two newer universities founded in the past 40 years, one original *"grande école"* and one research institute. The *"grandes écoles"* offer excellent and prestigious training opportunities for the very best undergraduate and postgraduate students as well as high-quality lifelong and executive learning opportunities. The universities contribute dynamism in connection with the development of the local area as well as innovative approaches to research and training in the two fields of excellence. In addition a research institute provides research and expertise in civil engineering, transportation and urban development. The paragraphs below set out the characteristics and added value of each of the founding members.

- The **Ecole de Ponts (ENPC)** is one of the world's oldest research and engineering training school and has been training the elite of French engineers for over two centuries. The ENPC has more than 1800 students, of which 800 are following a prestigious engineering course. It also offers top-quality executive education including a top-20 international MBA course and it provides training to 8000 adults. Its areas of research activity are in the sciences of mechanics, materials, applied mathematics, computing, environment, economics, city mobility and transport.

- The **Université Paris-Est Marne la Vallée (UPEMLV)** is a new university founded in 1991 and located the Cité Descartes, east of Paris. It has 11 200 students of which more than 20% are carrying out courses as apprentices, making it the number one university for apprenticeship courses in France. Its main areas of research excellence are cities, urban development, transportation and their sciences including social and human sciences, mathematics and ICT.

- **ESIEE Paris** is a *"grande école"* focused on technological innovation with a history of more than one hundred years in teaching students. It is made up of an engineering and a management school with 1400 students, of which more than 15% follow an apprenticeship route. The main areas of research excellence are image processing, wireless communications, microelectronics and innovation management. The ESIEE is also based at Marne-la Vallée.

- The **Université Paris-Est Créteil Val de Marne (UPEC)** is a university founded in 1971 and based to the South-East of Paris. It is the largest multidisciplinary university in the Ile de France region with 32 000 students. The university is made up of 12 components including two IUTs, the university hospital CHU Mondor, the IUFM (training institute for lecturers and professors) of the Créteil Academy and 23 mixed research units. Its main areas of research activity and excellence are health and medical, chemical and environmental sciences and the social and human sciences.

- **IFSTTAR** is a national research centre focused on engineering particularly related to civil engineering, urban infrastructure, transport systems, road safety, natural hazards and technologies related to the environment. The IFSTTAR has 1 200 staff of which 620 are researchers and 22 research units. It has well established internationally recognized expertise in civil engineering and transport systems all over the world.

- The **Ecole Nationale Vétérinaire d'Alfort (ENVA)** is the world's oldest veterinary school still on its original site on the edge of central Paris. Founded in 1765 the school is one of only four veterinary schools in France and has approximately 700 students and a national museum (*Musée Fragonard*). With 10 research teams particular areas of expertise include infectious animal diseases and public health, animal models and clinical research. Currently independent the ENVA is in the process of integrating with the UPEC. The National Agency for Food, Environment and Occupational Health and Safety (ANSES), already present on the ENVA site, will relocate its headquarters onto this site to create a cluster of scientific excellence.

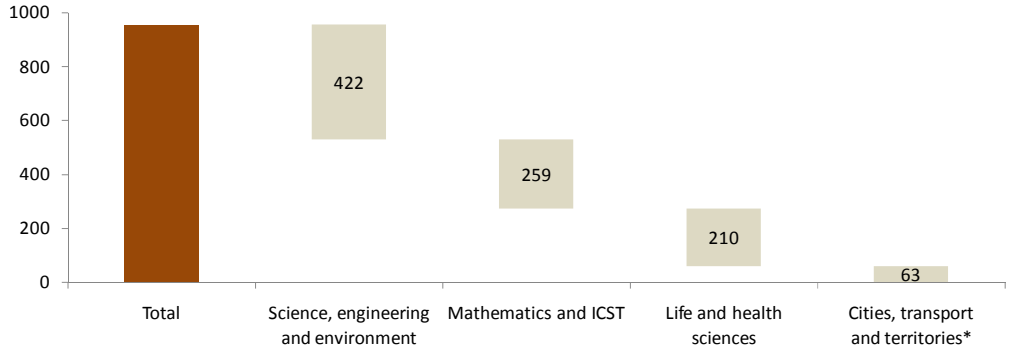
- The French **Institute for Public Health Surveillance (InVS) is a** public administrative body placed under the Ministry of Health, responsible for surveillance and alert in all domains of public health. His missions are focused on health surveillance, threat detection and alert, support to decision making in the management of health crisis. InVS coordinates surveillance networks in all areas of public health either in-house or operated by external partners. These networks gather and analyse health information data including health, risk factors and social determinants. InVS is in charge of reviewing knowledge related to health risks and their determinants, of the analysis of trends and identification of vulnerable groups. InVS also coordinates large health surveys in all domains of surveillance (population surveys with health examination, sero-epidemiological surveys, surveys in vulnerable groups…).

Brought together as a whole UPE's strengths are as follow:

- **A strong pool of research and expertise on science-based technologies**

Number of researchers and post-doctoral staff in science-based technologies (with breakdown by research department)[3]

[3] Source : UPE figures based, where available, on AERES evaluations 2007-08 and 2008-09



* This multidisciplinary research department includes staff working both in sciences and humanities subjects. This graph presents the researchers in sciences and technology.

The UPE has more than 950 researchers and post-doctoral staff working in science-based subjects and technologies (see graph above) with approximately 40% in science, engineering and environment and the other 60% equally spread across the other doctoral schools. Amongst these researchers there are 14 holders of a CNRS medal or a prize from the French academy of science.

The UPE has 14 research units judged as A or A+ by the French research evaluation agency (AERES)[4]. This includes 8 research units in the research department "science, engineering and environment" and the Henri Mondor bio-medical institute in the department "life and health sciences" alone has 14 research teams and over 120 researchers.

These areas execute external research projects worth more than 12 million euros per year through EU Framework Program and national ANR funding.

- **A unique combination of academics working on cities, environment and their engineering sciences both from a scientific and humanities perspective**

UPE includes the top cluster in France and an internationally recognized centre for scientific and humanities research into **cities, environment and their engineering sciences**. This cluster has more than 230 permanent research staff in laboratories directly linked to the research department for cities, transports and territories at ENPC, UPEMLV, UPEC and IFSTTAR. In addition more than half of the permanent researchers in the department for science, engineering and environment are involved in this field of excellence.

Two of the largest institutes for urban studies are within the UPE, namely the French institute for Urban studies (IFU) and the Paris Urban institute (IUP).

The doctoral school cities, transports and territories was evaluated in July 2009 by the French research evaluation agency AERES as A+ on all the criteria: scientific excellence, operations,

[4] These figures do not included the research expertise labs of IFSTTAR.

support and tutoring, support for career entry for PhDs). There are currently 250 PhD students in this area and 61 PhD theses were presented in the academic year 2009-2010.

The UPE is further strengthened in this field by the associate membership of three Paris architecture schools, one of which is also based on the university campus at Marne la Vallée, and the *Ecole des Ingénieurs de la Ville de Paris* (EIVP) focused on urban engineering and the *Ecole Supérieure des Travaux Publics* (ESTP) with strengths in civil engineering and infrastructure.

- **An impressive faculty in life sciences**

The UPE also has a strong and recognized faculty in life sciences with cutting-edge research projects and established links to expertise and agencies.

The *Institut Mondor de Recherche Bio-médicale* (IMRB) is a collaboration between UPE and the National Institute for Health and Medical Research (INSERM) with 300 staff and fourteen research teams. The IMRB has over 100 doctoral and postdoctoral fellows and has published more than 1400 articles in the last five years and obtained 34 patents. The IMRB was evaluated as A by the French agency for evaluation of research (AERES). The level of recognition with the wider public was recently underlined by the award of "person of the year" to Professor Lantieri, the first surgeon to have carried a complete face graft, by the readers of several daily French newspapers.

The cluster of ENVA and the National Agency for Food Safety, the Environment and Occupational Health and Safety (ANSES) constitutes 400 researchers with 10 ENVA research laboratories and 2 for ANSES. Evaluated as A/A+ by AERES it is illustrative of the strength of the cluster around the site of Maisons-Alfort bringing together excellence in research in medical sciences, veterinary sciences and protection.

- **A significant pool of high-quality academics in social sciences, economics and humanities**

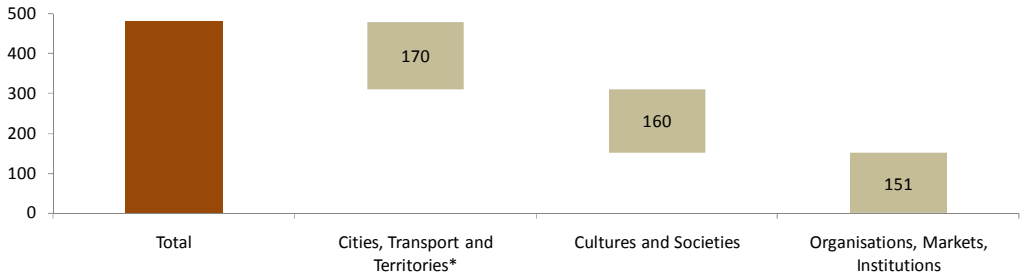
  The main characteristic of social sciences and humanities at UPE is innovation in interdisciplinary topics while maintaining academic excellence, and the promotion of practical applications, for example through new curricula. There are also a variety of on-going research contracts (ANR, institutions and local associations…), clearly oriented towards public health or political initiatives. Building on our strengths we are considering how to create more responsive and dynamic structures to help drive the most innovative research projects.

- The process of structuring social sciences, economics and humanities

work units is still in progress across the two universities, but it is clearly enhanced by the high-quality research of some UPE academics.

Within these soft science research units a number of them have been evaluated as A or A+ by AERES. In addition 45% of publishing researchers in a recent study were in research units judged as A or A+ within the social and human sciences[5].

Number of researchers and post-doctoral staff in social and human sciences (with breakdown by research department)[6]



* This multidisciplinary research department includes staff working both in sciences and humanities subjects. This graph presents the researchers in social and human sciences.

The two main doctoral schools in social and human sciences, "Cultures and Societies" (literature, communication, history, etc.) and "Organisations, Markets and Institutions" (law, management, economics, etc) were both judged A by AERES and there are currently 550 PhD students in these areas, making up approximately 40% of PhD students at UPE. In addition, as set out above, there are many soft science students in the doctoral school "Cities, Transport and Territories". 44% of Master's specialisms in social and human sciences have been evaluated as A or A+[7]. There are currently 9 UPE social sciences and humanities researchers enrolled in the French university institute (IUF).

- **In conclusion, a significant cluster for excellence in research and higher education**

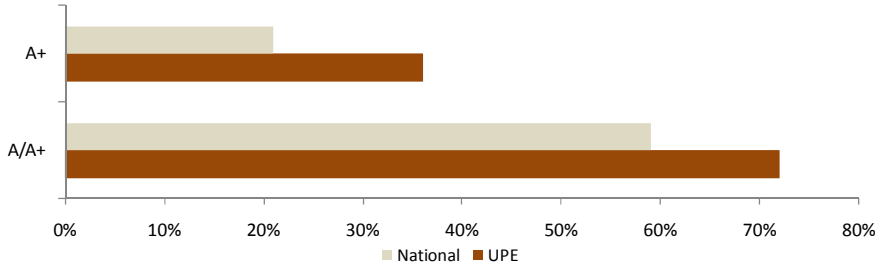
Thus the UPE is positioned as a multidisciplinary pole for research and higher education across a wide breadth of major importance for society. Furthermore several research units and master level courses are already interdisciplinary, not accounting for interdisciplinary research actions across the laboratories.

[5] STRATER (2010) Fascicule Paris-Est
[6] Source : UPE calculations based, where available, on AERES evaluations 2007-08 and 2008-09
[7] STRATER (2010) Fascicule Paris-Est

As a model for higher education the Université Paris Est is a significant cluster with over 45 000 students and more than 1400 academic researchers. Were it to appear as a single institutional unit in the QS university rankings it would be considered as "very large"[8]. It is comparable in size with the University of California Berkeley (35 000 students and 1500 faculty members)[9]. In sciences and technologies the science cluster of more than 950 researchers compares favorably with EPFL Lausanne (600 researchers), TU Delft (600 researchers) and the University of California Berkeley (400 researchers) in this area[10].

The quality of researchers at UPE is high and considerably above the national average of HE Institutions in France. 36% of researchers are within labs assessed as A+ by the AERES compared to a national average of 21%. 72% of researchers are in labs judged as A/A+ by the AERES compared to 59% nationally.

% of publishing researchers according to their AERES labs ratings[11]



In training, four of its six doctoral schools (67%) are judged as A or A+ in line with the national average[12].

UPE researchers are excellent in publications. A recent OST publication found that UPE has 1145 publications for 796 statutory research and academic staff giving an average of 1.45 publications per member of staff. This ratio placed UPE at the top of a study of 8 major French university poles with a publication rate per academic at 50% above the average.

UPE also has recognized international research contracts including 7.5 m euros of contracts from the EU framework programme contracts[13].

[8] QS methodology puts any university with more than 30 000 students as very large http://www.topuniversities.com/

[9] Key facts and figures from the University of California Berkeley website, http://www.berkeley.edu/about/fact.shtml

[10] Source : UPE benchmark carried out in 2008

[11] STRATER (2010) : Lignes de force de la région Île de France Paris Est

[12] AERES (2010) Synthèse des rapports d'évaluation des écoles doctorales de la vague D

[13] Source : UPE calculations

2.1.2. UPE's common ground

Despite the diversity of its membership UPE has a series of distinctive features which emerge where the complementarities of the different institutions are at their strongest.

- **Providing cutting edge interdisciplinary and systemic approaches to addressing scientific, technical and socio-economic problems.**

An urban area is a system of four kinds of systems that functions in an interlinked way: i) a set of actors, including households and firms, ii) economic structures including notably all kinds of markets and especially market for land use, employment and transportation, iii) "mutualised" infrastructures e. g. public utilities for water, energy and waste, iv) regulatory framework and public policy. Each system has a complexity of his own, for instance the urban transportation systems involves a set of mobility patterns together with a set of travel modes, each of which may be subdivided into four sub-systems of respectively infrastructure, vehicles, services and protocols, uses and usage.

For example the scientific and technological centre for construction (CSTB) and its UPE partners develop a modelisation of a city e. g. simulating the impacts of noise, light, heat and pollutants created by the activities in the city. Such a model requires a range of competencies including transport, networks, ICT, electronics (sensors), meteorology, civil engineering and acoustics.

However such a research project is also be used to inform and communicate with elected representatives, local people and other stakeholders. Thus sociologists have also participated in this research project to evaluate perceptions, for example through a virtual reality representation of the future urban area for citizens.

- **Each member contributing to the continuum between research, innovation and expertise**

The range of different institutions within UPE is a **genuine opportunity for innovation and technology transfer because they cover the value chain** from research to expertise for the private or public sectors. Through collaboration the complementary traditions and areas of excellence create momentum for greater innovation and expertise.

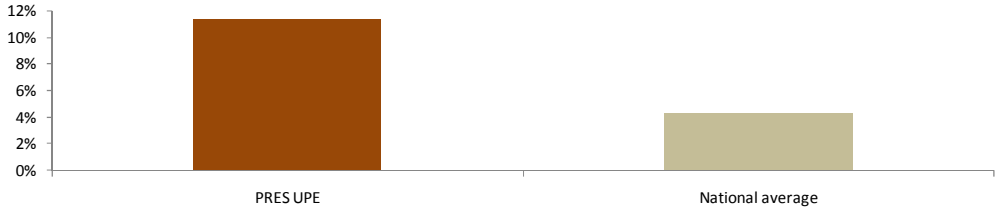
For example life sciences research at UPEC can potentially link quickly into work or research carried out by the agency for Food Safety, Environment and Occupational Health and Safety (ANSES). Similarly in the areas of sciences such as materials research may be carried out by units involved in the Labex MMCD (ENPC, UPEMLV, UPEC, LCPC) with the development of "industrial research and teaching chairs" as collaborations of public research organizations and private companies interested in promoting all scientific aspects related to a given subject.

UPE has a shared commitment to collaborate to exploit the opportunities along this value chain and gain maximum value from its members' complementary characteristics.

- **Being committed to professional skills**

All the founding members of UPE provide **high-quality multidisciplinary and interdisciplinary teaching** focused on professional skills, "grandes écoles" together with the two universities being leaders in vocational training.. In fact UPE has the largest number apprenticeship or modular sandwich courses of any university pole in France with almost 4000 students on apprenticeship courses. As such the proportion of apprenticeship students at UPE is more than 2.5 times the rate nationally (see graph below).

Proportion (%) of HE students on an apprenticeship course[14]



- **Striving to contribute to local development**

UPE is committed to **maximizing the impact on the local development of an area of high potential.** Its institutions are based at several sites in the Eastern part of the Paris region, one of the main areas of economic development and demographic growth for the French capital and its surrounding area.

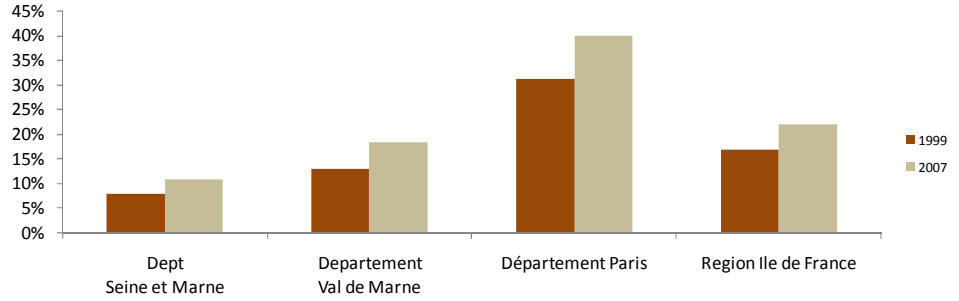
The two principal *"départements"* with UPE institutions are the *Val de Marne (94)* a relatively small urban department (245 km², 1.3 million inhabitants) close to central Paris (105 km², 2.2 million inhabitants) and the *Seine-et-Marne (77)* a large *"département"* (5915 km², 1.3 million inhabitants) covering both urban and rural areas. The *Seine-et-Marne* has undergone a still continuing extraordinarily strong growth as over the past 25 years with a growth of more than 45% between 1992 and 2008 compared to 1% in central Paris and 16% in the Paris region[15].

These areas also face considerable educational challenges. The proportion of the population with a bachelor's degree or above is below the regional average in both "départements" with a gap of almost 10 percentage points for the *Seine-et-Marne* compared to the regional average and 30 percentage points compared to central Paris (see graph below). As such it is an area where there are **considerable opportunities to further higher education** and add value to

[14] Sources: data for PRES UPE from the individual founding members (2008-2009). National average based on the national statistics RERS 2010
[15] Date from INSEE (2009)

the local society and economy. Improved skills can help to raise incomes also. Average salaries in these departments are approximately 22 000 euros per year compared to 29 000 euros in central Paris[16].

Proportion of the population aged over 15 with a higher education qualification above Bac+2 (e.g. DUT) [17]



The institutions of UPE therefore have a double commitment to be both world-class in training and research and to contribute to the development of the region to the East of Paris as illustrative of what can be achieved internationally. The research strengths in urban development and health sciences are perfectly suited given the level of urban expansion and the relatively poor health outcomes of the local health population[18].

- **Building partnerships with local socio-economic actors**

The UPE has strong links with businesses and economic sectors including through the role of IFSTTAR with recognized expertise capabilities, the role of the technical and scientific centre for construction (CSTB) and with the strong link with the service for studies into roads and planning (SETRA). The ENPC has develop several industrial chairs and common labs with industry.

Many UPE structures support businesses and contribute to the economic development of the local area. The creation of the competitiveness cluster *Advancity* for city and sustainable cities and mobility as well as collaborations with the *MEDICEN* and *Cap Digital* clusters have led

[16] Date from INSEE (2009) data on average salaries for year 2008
[17] Data from INSEE Chiffres Clés Diplômes Formation (2009)
[18] For example, the life expectancy in Seine-et-Marne is 18 months shorter than the average for the Ile de France region.

to several tens of millions of euros of projects for the UPE research centers. Dynamic relationships also exist through the three *Instituts Carnot* of members of the UPE.

2.1.3. The creation of UPE as a catalyst for transformation

In 2007 the existing collaboration between the institutions was formalized with the creation of UPE, a research and higher education pole (PRES) by a decree of 21 March 2007 as a public establishment for scientific cooperation (EPCS). By bringing together the best from a range of different institutions UPE constitutes a vibrant university with a global reach.

This PRES is both a space and framework for scientific cooperation and an institution in its own right with devolved responsibilities from its founding members. As a collaborative confederal project UPE has built considerable momentum for cooperation, delivering several projects at UPE level whilst keeping a relatively light central structure.

The **primary** operational **role** of UPE structure lies at the **PhD** level. The doctoral schools have been restructured to produce six multidisciplinary schools (with the same structure used for the UPE's research departments): 1. Science, engineering and environment; 2. Mathematics and ICST; 3. Cities, transport and territories; 4. Organisations, markets, institutions; 5. Cultures and societies; 6. Life and health sciences

A central team manages the **PhD** courses and examinations, supports the doctoral schools, encourages PhD students to take up research opportunities abroad and help prepare them for entry to work. All PhDs and HDR (approval to supervise research) degrees since 2007 are signed by the PRES président with the PRES taking full responsibility for the quality of the PhD and the doctoral schools. As such the PRES has enabled the institutions to clearly structure the training offer at PhD level ensuring excellence in admission, the quality of the offer and the expectations of the level of PhD theses. 49% of PhD students are of international origin with 79% of them receiving funding[19].

More generally the PRES has a role of coordination and facilitator in collaboration between the institutions where it can add the most value, for example the PRES also:

- coordinates a single scientific strategy with a single "UPE label" used for the production of scientific research carried out in the member institutions
- provides leadership in scientific cooperation for the institutional members with research teams following the doctoral schools structures:
- organizes collaborative committees for the recruitment of foreign researchers
- helps to harmonize the training portfolio and creation of international Masters courses

[19] Source : UPE calculations for the year 2010

- organizes the approach to innovation and expertise, leveraging world-class research with excellence in training and a capacity for expertise to respond to major societal challenges (innovation, skills suited to the labour market, etc.).

The "Campus UPE" project concerns several developments to develop research and teaching capacity across the sites at Créteil, Maisons-Alfort and the Cité Descartes at Marne-la-Vallée as well as student accommodation, upgrading the digital infrastructure and development of structures to improve the interactions with socio-economic actors.

Current major building initiatives within Campus UPE include:

- An environmental centre (*maison de l'environnement*), a central library, student centre (*maison des étudiants*), the Descartes+ energy-efficient building at Cité Descartes (in current contractual Plan State – Ile de France)
- Construction of the "Urban institute"(funded by the Ile de France and UPE)
- The renovation and reorganization of the medical faculty at UPEC (funded in the current contractual Plan State – Ile de France)
- The redevelopment of teaching and research areas as well as the museum Fragonard on the site of Maisons-Alfort (funded by the Agriculture and Research Ministries)
- The reorganization of buildings in the Copernic part of the Descartes campus of UPEMLV (financed as a "promising Campus" within the Plan Campus by the state through a PPP over 25-30 years)

As a result, UPE has enjoyed growing interest from other local partners. It currently includes 10 associate members such as engineering and architecture schools in addition to several national research institutes and agencies:

- The National Agency for Food, Environment and Occupational Health and Safety (ANSES)
- The City of Paris Engineering School (*l'École des Ingénieurs de la Ville de Paris EIVP)*
- The National Advanced Architecture School of Paris-Belleville *(l'École nationale supérieure d'architecture de Paris-Belleville*)
- The National Advanced Architecture School of Paris-Malaquais *(l'École nationale supérieure d'architecture de Paris-Malaquais)*
- The National Advanced School of Architecture and Territorial studies of Marne-la-Vallée *(l'École nationale supérieure d'architecture de la ville et des territoires à Marne-la-Vallée)*
- The School dedicated to Publics works Construction and Industry *(l'École spéciale des travaux publics, du Bâtiment et de l'Industrie ESTP)*
- The National Geographic Institute *(l'Institut géographique national IGN)* which includes the National School for Geographic Sciences *(l'Ecole nationale des sciences géographiques ENSG)*
- The national audiovisual institute *(l'Institut National de l'Audiovisuel INA)*
- The scientific and technological centre for construction *(le Centre Scientifique et Technique du Bâtiment CSTB)*

- The green technologies and sustainable cities cluster Advancity (*le pôle de compétitivité Advancity Ville & mobilité durables).*

UPE's confederal governance includes an elected President, a board of directors *(conseil d'administration)* with the founding members holding the majority of the votes and an Executive Committee composed of representatives of the founding members and the President. This **governance has proven to be clear and effective** in making strategic choices.

2.1.4. A focused strategy

Within this framework UPE made strategic choices in 2008 within the context of the "Plan Campus" to focus its efforts in research and training. Since then this choice has structured the strategy of UPE. The two main areas of development chosen in 2008 are domains where UPE is truly excellent against international standards:

- **Cities, environment and their engineering sciences**, with a field of excellence at the Cité Descartes, made up of several internationally recognized research teams including two Urban Institutes.

- **Health and society with several internationally-renowned research teams based at the Mondor university hospital, w**orld-class veterinary science at ENVA and the food, environmental and occupational safety agency all at close proximity.

Across the two domains the UPE enjoys:

- 1150 researchers (academic staff including post-docs) and 870 PhDs, approximately 80% of the total
- 18 research units which were evaluated as A or A+ by AERES
- 118 Masters courses that were judged as A or A+ by AERES
- >12 M euros of external research projects executed annually and 7.5 M euros of research contracts in the EU framework program
- 6 doctoral schools with one judged A+ by AERES and three as A, and with all judged A/A+ for scientific excellence

The strategy for these two areas is presented in section 2.2. This is a deliberate approach to build on UPE's strengths in two multidisciplinary areas that are of critical importance for public and private sector decision-makers.

2.2. *Excellence perimeter and added value of the Idex*

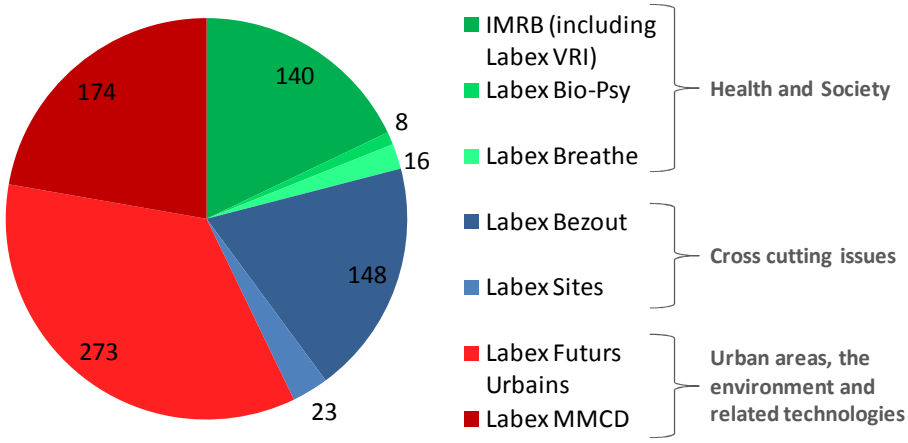
The interdisciplinary cooperation within the framework of UPE has strengthened UPE's common scientific culture, characterized by a problem-solving approach and a **focus** on two areas: "**Cities, environment and their engineering sciences**" and "Health and Society". UPE's capacity to develop internationally renowned projects in these two areas was most

recently demonstrated by the coherence of project proposals to the *Investissements d'avenir* programme.

UPE has decided to capitalize on its current strategy and strengths. Thus, **UPE's excellence perimeter encompasses all its *Investissements d'avenir* projects that either directly contribute to one of the two excellence areas or strengthen the links between these two areas (cross-cutting issues)**.

This corresponds to a research and teaching capability of 782 tenured academics (see figure below).

UPE's tenured academics in research teams within the excellence perimeter



In order for UPE to realize its ambition as an impactful problem solving institution, the *Idex* strategy will bring add considerable value to this perimeter through:

- A strong focus of resources (75% of total Idex resources)
- A new and relatively unexplored field of cross-cutting issues between UPE's two areas of excellence
- Increased international exposure and recognition
- Enhanced **flexibility** and **responsiveness** to emerging challenges facing society in UPE's areas of excellence

2.2.1. Cities, environment and their engineering sciences

2.2.1.1. *Issues facing society : the growing demand for sustainable urban areas*

According to recent projections more than 60% of the world's population will live in urban settings by 2030. Cities of developing countries will see almost 95% of urban growth in the next two decades and account for about 80% of the world population by 2050. As the world

is becoming increasingly urbanized, cities are an increasingly important arena for social and economic development. In France, urban areas concentrate around 90% of the economic value-added.

This rapid urban development is intrinsically linked to a broad range of environmental, social and economic issues. Both in France and internationally, there is a vigorous call to enhance the quality of life and services in urban settings (housing, noise, air, water, transport, etc.). In order to address this demand, it is crucial to develop new solutions enabling us to conciliate urbanization, socio-economic development and the protection of the environment. This calls for both new, innovative technologies and strong partnerships between all relevant stakeholders, including higher education institutions and political and economic actors at all levels.

As the challenges raised by urbanization processes are highly interdependent, adequate responses cannot be developed by a single scientific discipline. The "citizen lifestyle quality" working group of SNRI (National Strategy for Research and Innovation) has issued a call for "more multi-disciplinary integration" in this field. While multidisciplinary research programs are increasingly common around the world, the links between the scientific communities of the concerned disciplines are still embryonic and fragile. In this context, it is crucial to adopt an integrated approach that enables UPE to:

- Structure research along a continuum from fundamental to applied research
- Integrate all relevant disciplines in research efforts responding to the challenges raised by the demand for sustainable cities: architecture and urban development, environmental sciences, engineering sciences and technology, social and human sciences, etc.
- Develop opportunities for young researchers and educational programmes building on the synergies between those disciplines

2.2.1.2. *UPE's strengths*

Based in the area East of Paris, UPE integrates all major dimensions of a systemic approach to sustainable urban development. Its key strengths are the diversity of disciplines involved, the culture of interdisciplinary cooperation on cross-cutting issues in the field of urban development and close partnerships with both the private and the public sector. In particular "living labs" in the local environment have helped UPE developed research programs of international reputation in this field.

UPE encompasses two universities including two institutes of urban development, one engineering school and one research institute with a high research environmental and transport institute as well as various architecture and school. It includes several research units in mathematics and physical sciences, in economics and social sciences and in life sciences . This unique combination of knowledge and skills positions us among the leading clusters at global level in **cities, environment and their engineering sciences**. UPE's scientists and partners from the private sector have played a key role in the creation of

European initiatives in this field, such as the *European Construction Technology Platform and the Energy Efficient Buildings European Initiative* (E2B EI).

In 2008, the Research Department of the French Ministry of Transport (MEDDTL – DRI) produced an international benchmark study on technological and scientific clusters in the field of sustainable urban development. The study includes *University of California – Berkeley*, *Ecole Polytechnique Fédérale de Lausanne* (EPFL) and *Technische Universiteit Delft.* The comparison shows UPE's potential as a leading international cluster in terms of both the number of researchers and the variety of research areas (see figure below):

Comparison of major scientific clusters in the field of sustainable urban development[20]:

	Berkeley	EPFL	Delft	UPE
Nb of researchers and post-doctoral staff	400	600	650	695
Focus areas	•Urban and regional development •Transport •Environmental modeling	•Urban planning •Transport •Architecture	•Materials sciences •Urban planning •Environmental sciences •Architecture	

UPE research teams are used to working together in various **interdisciplinary projects**, particularly within the framework of the ***Descartes Cluster*** at Marne la Vallée. Chosen by the Government as a cluster of excellence in contribution to the Greater Paris Scheme, *it* is designed to become the future leading cluster worldwide in the building, maintenance and services of sustainable cities. The cluster is made up of:

- ***Cité Descartes***, a site of scientific and technical excellence focusing on eco-technology with
  - Academic institutions mentioned above which have develop strong relationships with the economic sector including fifteen strategic partnership
  - the MEDDTL's Scientific and Technical Cluster; an exceptional melting pot of skills including the MEDDTL's major scientific establishments, the Ile-de-France's top-tier schools and universities, and private research facilities.
  - The Advancity competitiveness cluster on sustainable cities and mobility, designed to be a catalyst for innovation by bringing together: opportunities for green growth, accentuated by the *Grenelle de l'Environnement* process, involving about 140 businesses in the cluster, including 13 world-leading

[20] Source: *Constitution d'un Pôle Scientifique et Technique à Marne la Vallée - Benchmark*, MEDAD – DRAST, 2008

companies and numerous small and medium-sized enterprises and industries, producers and operators in the energy, transport, environment, civil engineering and construction fields, engineering companies, and companies providing services to local authorities and to industry;

- EPA-Marne in charge of urban and land planning of the area

Moreover, UPE is involved in **three *Instituts Carnot*** all designed to strengthen research with private and public sector organizations: ***VITRES,*** which is led by UPE members and encompasses 22 research teams in the fields of civil engineering, urban planning and development, public services and regional planning strategies; ***INRETS,*** which encompasses 12 research laboratories of the IFSTTAR; ***CSTB,*** which builds upon the research infrastructure of the French Scientific and Technical Centre for Building.

UPE's scientists also play a key role in the **Institute of sustainable metropolis** (IMD). Recently founded by the City of Paris and the Region of Ile-de-France, the IMD is to become an international forum of innovation on sustainable cities by building an international forum of dialogue for academic and non-academic experts as well as decision makers.

UPE's recent efforts in restructuring **postgraduate education** according to multidisciplinary research agendas have led to remarkable results in the field of sustainable urban development. Two PhD schools should be mentioned specifically in this context: *"SIE"* offering programs in the field of Science, Engineering and Environment and *"VTT"* concentrating on topics related to Cities, Transport and Territories, with the latter graded A+ in all categories by AERES.

The **close cooperation of UPE member institutions with both private businesses and public institutions** is not only an asset for research. They have constituted a robust network of clients for **expertise**. UPE's clients are leading companies and local councils such as BOUYGUES, EIFFAGE, EDF, EGIS, IOSIS, LAFARGE, SNCF, RATP, GDF-SUEZ, VEOLIA, VINCI as well as numerous SMEs.

2.2.1.3. *UPE's applications to the « Investissements d'avenir » program*

In the context of the *Investissements d'avenir* program, interdisciplinary integration has reached a new level. All the UPE projects in the field of urban areas, the environment and their related engineering sciences promote an integrated approach to the challenges raised by the rapid urbanization. Projects involve engineering and physical sciences (mathematics and computational sciences, chemistry, physics and mechanics of materials, chemistry of the atmosphere, information technologies, etc.) as well as social sciences (urbanism, sociology, economy, law, etc.).

UPE's research into **cities, environment and their engineering sciences** covers two major fields of research, represented in two Labex projects:

- **Materials, networks and structures** in the ***Labex "MMCD"*** *("*"Multi-Scale Modeling and Experimentation of Materials for Sustainable Construction"), with 174 scientists in units graded A/A+ by AERES
    - **Materials sciences**, particularly in cooperation with internationally leading companies of the energy, chemical and construction industries
    - **Modeling, numerical simulations**, experimentation and imaging, in mechanics and physico-chemistry of multi-scale, heterogeneous materials
    - **Engineering sciences** for the construction of cities, networks and energy networks in cooperation with the Tongji University, Shanghai, MIT and Georgia Tech

  Until recently civil or environmental engineering and energy or waste management have essentially relied on empirical methods and macroscopic phenomenology, but could not implement scientific investigation techniques at a level comparable to what was done in various fields such as solid physics, crystalline solid chemistry, etc. Indeed, natural or civil engineering materials have a complex, multi-scale, heterogeneous structure, implying that a huge variety of interactions, chemical and physical processes are concurrently at work, and collectively determine macroscopic properties. This creates major difficulties, not only to access the relevant scales and phenomena, but also to disentangle their respective contributions, and, in the end to understand how processes occurring at different scales combine into macroscopic behaviour.

  In order to reach materials design and optimization objectives it becomes more important to have a deeper understanding of all scales and phenomena. There is definitely a need for an advanced research on materials and phenomena in sustainable construction, relying on approaches involving the top research means for the modelling, numerical simulations, experimentation and imaging, in mechanics and physico-chemistry of multi-scale, heterogeneous materials.
  The goal of this Labex is thus to structure a multidisciplinary group, based on several existing teams which are regularly involved in application of their works to materials or situations related to sustainable construction or environmental problems in collaboration with industry (Lafarge, Saint-Gobain, Schlumberger, Bouygues, EDF, ANDRA, etc.), or public applied research centers (IFSTTAR (formerly LCPC-INRETS), CSTB, BRGM, IFP énergies nouvelles, etc.). The project also aims at developing master and doctoral studies, and professional training. The project is hosted by PRES « Université Paris-Est » and coherent with its IdEx project.

- **Town planning and environment** in the *Labex* "**Urban Futures**" (*Futurs Urbains)*, with 273 researchers in units graded A/A+ by AERES:
    - Biological and chemical **quality of air and water**, in cooperation with OSU (Observatoire des Sciences de l'Univers). The excellence of UPE's researchers

in this field has been proven by the participation of UPE's LISA, LEESU and CEREA laboratories in numerous European and international programs

- **Climate change and its economic impact**, with the *Centre International de Recherche sur l'Environnement et le Développement* participating in the in the work of the *Group of Intergovernmental Experts on Climate Changes* awarded the Nobel Peace Prize in 2007
- **Urbanism, architecture, town planning and transport** involving eight renowned laboratories, two institutes of urban development cooperating closely with several international partners e. g. Nanjing University (China), a school of architecture and the project of a Tourism Institute, unique in France.

The LABEX *Urban Futures* project is built to cope with the fact that the complexity and overlapping nature of challenges linked to sustainable development call for scientific approaches that will go beyond the circumscribed limits of any given discipline.
Indeed we started by four key issues to identify significant domains in which a multi-disciplinary approach will help meet key scientific challenges:

- The emergence of globalised metropolises involves rethinking interactions between economic dynamics, technical innovations and social transformations.
- There is now massive interaction between human urban activities and the environment that requires "decompartmentalisation" of modelling approaches by incorporating physical air and water parameters, urbanisation choices and transport models.
- Urban quality of life and new forms of social vulnerability are increasingly underpinned by accessibility of services, mobility possibilities and command over technical interfaces. Thence the need for a careful analysis of urban usages and technical approaches as well as an examination of how transport and mobility are evolving and a reflection on the resulting new methods of governance.
- The material production of cities in terms of construction, renovation or maintenance - or at the day-to-day operational level that we refer to as the urban metabolism - raise questions that are also bound up with usages, public policy or innovation.

To carry out the research inherent in these observations, our project is based around building structures that will develop multi-disciplinary approaches in the following ways: through exchanges and conferences; through seed-funded joint, internal incentive research programmes; through multi-disciplinary solutions to problems encountered in the professional sphere; and by harnessing the resources of the LABEX-funded EQUIPEX project (geo-located databases, digital archives that collate urban research documents, urban environment simulation and observation tools, and systems to facilitate inter-modal transport).
Our other aim is to help showcase French urban research through a series of initiatives that will also be organised around multi-disciplinary research themes that we have identified.

These initiatives will include creating two international chairs (one for visiting, internationally renowned researchers, the other to provide scholarships for high-potential post-doctoral researchers), organising a biennial international conference, and training and leveraging programmes based around what we have described earlier.

Both of these projects are linked to the UPE project **"Institute of excellence for decarbonized energies - Sustainable Cities"** (*IEED*). In the perspective of the *Grenelle de l'environnement,* the *IEED*'s objective is to exploit new markets and facilitate the emergence of new careers related to sustainable urban development. To achieve this, the *IEED* adopts an integrated approach based on "urban living labs". These living labs integrate research and innovation processes through experimentation. This will to further strengthen partnerships between UPE member institutions, private businesses and public institutions. The *IEED* will also foster innovative teaching and vocational training by consulting HEIs.

These initiatives are complemented by **seven *Equipex* projects** which **will contribute to the joint effort of interdisciplinary research**: *IRMAT* : Multinuclear imaging for materials sciences; *ANVAAT* : Digital Archives on Cities, Town planning, Architecture and Transports; *Belgrand* : Data-mining on Cities and the Environment; *Urbatron* : Experimental platform for the analysis of environmental issues in urban settings; *Claire-Siti* : *Intelligent reference system* for intermodal transport, *Sense city* : Nano-materials nano-captors for infrastructure, cities, transport and the environment; *Structeco* : experimentation platform for eco-responsible structures.

2.2.2. Health and society

2.2.2.1. *Issues facing society*

In the early 21st century, public health is confronted with growing challenges related to the rapid growth of the world population, the ageing of European - including the French - population, rapid urbanization, climate change, air pollution, etc. UPE's research in the area of health and society focuses on the challenges described below, all of which are of major importance in terms of public health and society as a whole.

The need for a structured effort in search of effective vaccines against HIV and HCV
It is estimated that 34 million people are HIV positive, approximately 2 million lives are lost due to the disease and 2.7 million people become HIV positive each year. Despite more than 25 years of research, efforts to develop an effective vaccine against HIV/AIDS have been unsuccessful. There remain many significant obstacles to developing an effective vaccine to HCV infection. Although several aspects of the physiopathogenesis of these two infections differ, they share common challenges in the development of an effective prophylactic and therapeutic vaccine. In addition to the scientific barriers, the quest for vaccine development

has also been hampered by the fragmented community of researchers, a limited interaction with other disciplines and difficulties in mobilizing funds.

Linking animal health and human health in research on infectious diseases
Recent global phenomena, such as the bird flu epidemic or food crises, illustrate the need to consider the linkages between the health of humans and that of domestic and agricultural animals. Both the transmission of infectious diseases from animals to humans and the question of food security are major research topics for the years to come. In order to respond to these challenges, it is crucial to strengthen the role of the veterinary sciences in research on infectious diseases.

An interdisciplinary approach to mental health
Today, mental illness is one of the major causes of disabilities (in France and internationally). Suicide still constitutes the first cause of death among 25-34 year olds. Quite apart from the suffering of patients and their families, mental health problems raise major costs for society. According to a recent study by the *Fondamental* national research network, direct and indirect costs are estimated at about 107 billion euros per year in France alone. Both research on mental health and patient care would clearly benefit from a further enhanced interdisciplinary cooperation, particularly between psychiatry and neurosciences, in order to enable the psychiatrists of tomorrow to develop the best therapeutic solutions.

Surgical sciences: new technologies and human resources at national level
If the possibilities of surgical practice have progressed rapidly in recent years, this is largely due to technological innovation. Yet, for new technologies to be effectively used, surgeons need to adapt their daily practice. Hence, the challenge in this field is not only to trigger technological innovation but to train surgeons in the use of technologies and, in the long run, to educate a new generation of surgeons capable of adapting quickly to technological change.

2.2.2.2. *UPE's strengths*

In the area of health and society UPE builds upon a world class potential in both research and teaching. Among the most remarkable institutions are the hospital group *Henri Mondor-Albert Chenevier* (300 researchers), the *National Veterinary School of Alfort* (ENVA: 80 researchers), the French Agency for Food, Environmental and Occupational Health and Safety (ANSES) as well as several other internationally renowned safety agencies, the Médicen cluster for medical technologies, and a number of private laboratories such as Roche or Servier Sanofi.

Scientific research on the *Mondor* site benefits from exemplary linkages between fundamental and clinical research. Fundamental research is organized around the *Institut Mondor de Recherche Biomédicale (IMRB*), which disposes of 300 staff (140 tenured academics; 60 engineers, technical and administrative staff; 100 doctoral and post-doctoral researchers). For clinical research, *Mondor is* the largest centre in the Ile-de-France region.

UPE's medical research is internationally renowned in the following areas:

- ***Infectious diseases***: The Labex project *Vaccine Research Institute* in cooperation with the renowned *Institut Pasteur* and includes the Nobel Prize winner Françoise Barre-Sinoussi and other top researchers.
- ***Zoonotic diseases*****:** The cooperation between *IMRB* medical research teams, *ENVA* and *ANSES* positions UPE as an international leader on research into the linkages between human and animal health. The unique alliance of virology specialists and veterinary science has enabled UPE to lead a number of highly innovative research programs on zoonotic diseases. In cooperation with ANSES, UPE's researchers also explore food-related health risks, particularly through the *Equipex* project *Icubemerge.* Moreover, ENVA and ANSES are partners of a *Labex* project on integrative biology and emerging diseases.
- ***Mental health***: UPE is the leading actor in the nationwide network for research and patient care *Fondamental* and has put together a *Cohortes* project and a *Labex* project in this area in cooperation with *Université Pierre et Marie Curie*.
- ***Surgical sciences***: UPE professor doctor Lantieri recently realized the first ever complete face transplant. UPE researchers have also developed innovative techniques in mini-invasive urology, vascular surgery and participated in various European projects in these areas.
- ***Biotherapies***: UPE researchers are particularly well-known in stem cell transplants and genetic therapies of neurodegenerative disorders

Tenured academics of the *Mondor* site published around 300 articles in 2009, almost 1/1000 of world scientific production in the field with a two-year citation index superior to one. Their works are regularly published in top international journal: 2 publications in the *New England Journal of Medicine* in 2009, 1 en 2010; 1 publication in *Lancet* in 2008); 1 publication in *Nature* in 2009 and 1 in 2010; 1 publication in *Science* in 2009 and 2 in 2010.

These strengths in scientific research are also translated into **high quality education** in medicine and public health. UPE's *University Hospital Center* (CHU) was ranked 4th in the 2009 National Ranking Examination (Examen Classant National-ECN) which all French medical students are required to sit at the end of the second cycle of medical studies. It offers an internationally renowned Masters programme in surgical sciences and lifelong learning programmes in endoscopy and urology. UPE offers leading education programmes in infirmary, kinesiotherapy and public health management in France. Moreover, interdisciplinary programs on epidemiology are developed in cooperation between ENVA and ANSES within the framework of the doctoral school "Life sciences and health".

2.2.2.3. *UPE's applications to the « Investissements d'avenir » program*

Building upon UPE's current strengths the projects within the framework of the *Investissements d'avenir* programme all propose interdisciplinary approaches to tackle the major challenges described above.

The ***Labex*** **project "Vaccine Research Institute"** (VRI) is a research center and network fully dedicated to the development of an effective vaccine against HIV/AIDS and HCV diseases. It consists of 14 research teams covering a wide range of disciplines from immunology, epidemiology, and virology to biostatistics, systems epigenomics and communication. It involves top level scientists including the 2008 Nobel Prize in Medicine Pr Françoise Barre-Sinoussi. The VRI build upon the development of an innovative immunomonitoring platform, based at the *Mondor* site, dedicated to perform integrated and extensive phenotypic, functional and genomic analyses of immune responses in compliance with international standards.

The ***Labex*** **project "Laboratory of Biological Psychiatry" (Bio-Psy)**, which associates psychiatrists, neuroscientists, and geneticists with other scientists to carry out cutting edge research in these new fields of biomedicine. Bio-Psy blossoms at the intersection of two recently created networks: the Paris school of Neuroscience and FondaMental foundation. It will offer the critical mass and international visibility necessary to achieve a qualitative and quantitative jump in psychiatry research in France and will provide the most advanced training to a new generation of young psychiatrists, researchers, and health professionals. In the same field, UPE presents a ***Cohortes*** **project** to follow a large group of patients with schizophrenia, bipolar disorder and Asperger syndrome in cooperation with Bio'Psy researchers.

The ***Labex*** **"BREATHE"** aims to establish a sound scientific based methodology dedicated to the design and translation into clinical practice of innovative sound-scientific based respiratory treatments. In addition to the UPE teams, it associates the *Université de Versailles Saint-Quentin*, *Université Pierre et Marie Curie* and *Ecole polytechnique*.

Moreover, UPE is involved in: a *Labex* project on cognitive disorders in cooperation with *Ecole national supérieure cognitiques* at Bordeaux; a *Labex* project on leukemia; the *Cohortes* projects "RADICO" on rare diseases, "CoBlance" on bladder tumors; and *Biobanques* project bringing together medical and biological research.

2.2.3. Cross cutting issues: the added value of the UPE Idex

2.2.3.1. *Facilitate scientific cooperation on cross cutting issues*

UPE's two areas of excellence are of inherently interdisciplinary nature. Yet, the *Idex* must not be limited to strengthening projects within these two areas. Rather, it must foster scientific cooperation on cross cutting issues.

Science, Technology and Innovation in Society

Contemporary societies are confronted with major challenges where science, technology and innovation play a key role. Taking these challenges seriously requires ambitious developments in the Social Sciences and Humanities in order to overcome the many limitations of current policies regarding a "Knowledge Economy", and more generally, a

"Knowledge Society". In this context, UPE's ***Labex* project SITES** aims at creating a world leading centre for research and higher education in the cross-disciplinary field of Studies of Science, Technology and Innovation in Society (STIS). This project brings together two main branches, Science and Technology Studies including historical approaches and Studies of Policy for Research and Innovation (SPRI). Until now they have mainly developed independently, which has limited their impact, intellectually as well as in terms of contributions to societal challenges. Labex SITES has a unique capacity connect these fields and produce cutting-edge research to provide a better understanding of the complex, multilayered nature of the production of scientific and technological knowledge. It is proposed by UPE in partnership with PRES HESAM, CNRS, INRA, IRD, and Université Paris 13.

Urban development and access to health care

The rapid development of urban areas in recent years have led to increasing disparities in access to health care, both in France and many other countries around the world. This is particularly true for the Ile-de-France region, where government studies forecast a population growth of 8.4% until 2030 and a decrease of the number of physicians of 19.5%. The *Idex* will enable UPE to exploit synergies between the variety of skills and knowledge it brings together in urban planning, geographic modeling and analysis, medicine, public health, etc. , notably to foster emergence of new services.

In this context, UPE already leads an *ANR*-financed **"Performance and Systemic optimization of Emergency medicine" project** in cooperation with the Laboratoire de Génie Industriel at Ecole Centrale Paris. The objective of this project is to optimize the organization of the service provided by the SAMU-SMUR Emergency Medical Aid Service system by using a systemic approach taking into account all the elements of this complex care delivery system in an urban context.

Urban development, the environment and public health

The effects of urbanization and environmental changes on public health have become a major concern and issue of both scientific and public debate in recent years. Air pollution causing respiratory and cardiovascular diseases is only one example illustrating the need to strengthen cooperation between social sciences, environmental sciences and medical sciences. A number of UPE researchers participating in the "Laboratory on atmospheric systems" (LISA) with *Université Paris Diderot* and the CNRS already work on these issues. However, the *Idex* aims to further strengthen interdisciplinary projects in this field.

Engineering sciences and the development of medical technologies

Technological innovations are a key factor of progress in today's medical practice, be it through medical imaging and computational sciences, nanobiotechnology or bio mechanics. UPE has a high potential in this field, with the involvement of ESIEE engineering in the development of medical technologies and research projects at IMRB on the role of nanoparticles in pulmonary pathologies. In this context UPE's ***Labex* project Bezout**, which

focuses on the interface between mathematics and computer sciences, will play a key role by developing new methods for medical image analysis and genomics.

2.2.3.2. *Strengthen the coherence of UPE's scientific project and its international visibility*

The ambition of the *Idex* is to respond to the priority challenges facing UPE in order to strengthen its position as an internationally leading problem-solving institution in its areas of excellence.

The first challenge is to guarantee the **coherence** of efforts in research and teaching within the excellence perimeter. This depends on UPE's **capacity to focus and manage its resources**, be they human, material or financial. In this perspective, the *Idex* must enhance UPE's capacity for strategic management strengthening its reactivity and flexibility to tackle future challenges facing society. Thus, the common objective of all mechanisms and projects encompassed by the *Idex* is to create an enabling environment and incentives for interdisciplinary projects tackling emerging challenges in UPE's areas of excellence (see section 3). Yet the impact of the *Idex* must not be limited to this excellence perimeter. The objective is to mainstream the problem solving culture and strengthen interdisciplinary synergies throughout UPE by maximizing the **leverage effect** of *Idex* funded projects.

Strengthening coherence also includes consolidating the **common culture** and identity of UPE's scientists. In order to effectively structure research activities in a continuum from basic research to valorization, UPE's research is problem-based approach in the design and implementation of their projects. The "**living labs**", from which UPE research is drawn, are an element of UPE's problem-solving approach. In order to further strengthen UPE's position as a pioneer in both research and education on the territory to the East of Paris, the *Idex* will also enable UPE to deepen its cooperation with the neighboring safety agencies (ANSES, INVS), private businesses and public institutions in all relevant sectors.

The second major challenge is to enhance UPE's **visibility and attractiveness** in its areas of excellence at national and international level. Thus, this *Idex* will firstly enable UPE to **attract** more international **top talents** at all levels. UPE needs to recruit internationally-renowned scientists to boost its research capacities and attract the best PhD students to guarantee and consolidate these capacities in the future. Recruiting the very best is also essential to assure UPE's continued excellence in education (see section 4 on the HR strategy). The *Idex* will also enable UPE to **strengthen** existing **partnerships** and build new ones with other internationally renowned research institutions. Bringing together a critical mass of researchers and skills in their areas of excellence, the Idex strategy will enable a transformation into an institution with increased international visibility and attractiveness.

2.2.4. Application to the actions of the programme « Investissements d'avenir »

AAP concerné	*Acronyme du projet*	*Nom du coordinateur*	*Consortium /partenariat impliqué*
IEED	**Villes Durables**	UPE / Advancity	EPA Marne / CSTB, Paris Région Innovation Lab'/ Seine et Marne développement / etc.
LabEx	**Futurs urbains** (Centre de recherches avancées pour l'aménagement)	UPE	**ENSA Belleville et Malaquais/ENPC / INRETS / UPEC / UPEMLV**/CNRS
LabEx	**MMCD** (Modélisation et expérimentation multi-échelles des Matériaux pour la construction durable)	UPE	**ENPC/ UPEMLV / UPEC / LCPC** / CNRS
LabEx	**Bezout** (Modèles et algorithmes : du discret au continu)	UPE	**ENPC / UPEMLV / UPEC / ESIEE** / CNRS
LabEx	**SITES** Sciences, Innovations et Techniques en Société	UPE	IFRIS/UPEMLV, CNRS, EHESS et CNAM (PRES HESAM), U. Paris 13, INRA, IRD
LabEx	**Odyssée** (Organisation et Dynamique des Systèmes et Services Ecologiques et Environnementaux, des concepts à la gestion)	PRES Sorbonne Universités	UPMC / **UPEC** / CNRS / IRD / ENS / MNHN / AgroParisTech / EPHE / U. Paris Sorbonne / Inserm / INRA / U. Paris Diderot
LabEx	**ESEP** (Exploration Spatiale des Environnements Planétaires)	Observatoire de Paris	**UPEC** / UVSQ / U. d'Orléans / UPMC
LabEx	**ISPL** (Institut Pierre Simon Laplace)	CNRS	**UPEC** / UPMC / UVSQ / U. Paris-Diderot / U. Paris 1 / CNRS / EP / MNHN / EPHE / IRD
EquipEx	**ANVAAT** (Archives numériques Ville, Aménagement, Architecture, Transport)	UPE	**INRETS** / **UPEMLV** / **UPEC** / CNRS / LCPC / **ENSA Belleville et Malaquais** / AgroParisTech
EquipEx	**Belgrand** (Grand équipement constitué de bases de données pour la ville et l'environnement)	UPE	**INRETS / UPEC** / IRSTV / IGN / BIPE / LIRMM / IRD
EquipEx	**Urbatron** (Plateforme expérimentale pour l'analyse de l'environnement en milieu urbain)	UPE	**ENPC / UPEC** / **Cerea** (EDF / ENPC) / U. Paris-Diderot
EquipEx	**Claire-Siti** (Système de référence intelligent pour le Transport Intermodal)	UPE	**INRETS** / GRETIA
EquipEx	**IRMAT** (Imageur RM multi-noyaux)	UPE	**LCPC-ENPC /** CNRS **/ UPEMLV /** INRA **/** U. Avignon
EquipEx	**Sense city** (Nano-matériaux et nano-capteurs pour les infrastructures, la ville, les transports et l'environnement)	UPE	ESIEE / LPICM
EquipEx	**Structeco** (Plateforme d'expérimentation pour structures éco-responsables)	UPE	LCPC
LabEx	**VRI** (Vaccine Resarch Institute)	UPE	UPEC / ANRS / Paris 11/ Institut Pasteur / CEA / Inserm / Bordeaux 2 / CNRS / UDS
LabEx	**BREATHE** (Biomécanique REspiratoire et cellulaire des Atteintes pulmonaires et des THErapies inhalées)	UPEC	Inserm / AP-HP / UPMC / Ecole Polytechnique
LabEx	**Hemex** (Hématopoïèse expérimentale)	Paris 11	**UPEC** / Inserm / CEA
LabEx	**Bio-Psy** (Laboratoire de Psychiatrie Biologique)	PRES Sorbonne Universités	UPMC / **UPE / UPEC** / Inserm / CNRS / Institut Pasteur / AP-HP
LabEx	**HSDS** (Hotêl des Sciences pour un Développement Soutenable)	Fondation maison des Sciences de l'Homme	CNRS, CIRAD, EHESS, **Ecole des Ponts**, CIRAD, AgroParisTech, **Université Paris-Est**
Cohortes	**Psy-Coh** (Cohorte française de trois maladies mentales majeures : Asperger, Schizophrénie et Troubles bipolaires)	UPE / fondation Fondamental	**UPEC** / UPMC
EquipEx	**Icecumerge** (Plateforme des maladies infectieuses animales & zoonotiques émergentes)	UPE	**ENVA / ANSES / UPEC /** INRA / USC
SATT	**Sorbonne Paris Cité**	PRES	**UPE** / Institut Pasteur / U. de Cergy / Inserm

	& Paris-Est	Sorbonne Paris Cité	

3. Project and prospects

Being in an emerging territory facing various economic and social challenges, UPE is deeply committed to the impact imperative. UPE's research may be fundamental or finalized, the education designed for highly talented students potentials or vocational, it always tries to assemble interdisciplinary capabilities to tackle concrete and specific challenges (section 2.2).

UPE's ambition in the context of the "Initiative d'excellence" call for proposals reflects its DNA: **to be recognized as a high impact problem-solving institution with an international reputation within its areas of excellence**.

This ambition requires the implementation of **an innovative development model** and **new structures** to nurture UPE's excellence in the long term.

UPE's new development model consists in coordinating the efforts in research, education and expertise on tackling a few strategic socio-economic challenges within these areas of excellence. UPE-Idex will focus on a few major challenges and elaborate strategic responses in the short, mid and long terms leveraging basic and applied research, education, training and learning and expertise. This development model requires a very strong focus of activities and resources.

This will be achieved through the following levers

- An **emergence platform** to identify the key challenges on which UPE wants to focus its resources and make a distinctive contribution (section 3.1 and section 4 on governance implications)
- An interdisciplinary tool designed to help **complex systems modeling (section 3.1.)**
- **A call for proposals** to implement this strategy in **research** (section 3.2.)
- **A call for proposals** to implement this strategy in **education** (section 3.3.)
- A **foundation** to leverage partners involvements (section 4)

Section 4 describes how UPE will drive this new development model and its implications in terms of governance.

In parallel, UPE will foster the **consolidation of new structures** to nurture excellence in the long run and develop its attractiveness and visibility in its areas of excellence. This consolidation entails current projects already described in the previous section: top level research departments with the five *Labex* (see section 2.2.); a public-private institute on sustainable cities (IEED, see section 2.2.); active participation of UPE in the Advancity Cluster (see section 2.2.). It also encompasses *Idex* specific projects (see figure hereunder) such as:

- Constitution of highly visible education institutions within excellence areas (section 3.6.): a **UPE Health School**, a **UPE Urban Institute**, a **UPE technological** set of courses
- **Lifelong UPE**: A strong development of lifelong learning on UPE areas of excellence (section 3.7.)
- **UPE experts**: a strong boost to its expertise activity focused on UPE areas of excellence (section 3.8.)
- **UPE Equal opportunities Institute** (section 3.9.)

3.1. *Emergence Platform*

The Emergence Platform, hereafter referred to as « the Platform », is an innovative instrument to enable UPE to identify future challenges in its areas of excellence and define responses to these challenges in terms of research, education and expertise. As set out below, the process driven by the Platform will help UPE to guarantee the coherence of its activities while enhancing the culture of innovation in cooperation with external partners. In order for today's research to fuel tomorrow's teaching and expertise, UPE will build upon its strengths in problem-based research and the structure of its research activities, organized along a continuum from fundamental research to socio-economic value creation.

The "emergence process" will be organized in four phases:

1. prospection and identification of key challenges[21];
2. review of UPE's capabilities;
3. prioritization of the identified challenges;
4. elaboration of UPE's responses.

A systematic evaluation of UPE responses' to the identified challenges will guarantee that future prospection builds upon lessons learnt from ongoing actions (see section 4.3 for evaluation and quality control mechanisms).

3.1.1. Phase 1: Prospection

The goal of the first phase is to identify five to ten major socio-economic and/or technological challenges in the areas of excellence. This phase is a consensus-building process, which will bring together UPE faculty members and external experts, both academics and non academics researchers. Throughout the process various methods will be used:

- an analysis of academic and professional literature as well as online research, nationally and internationally.
- the organization of seminars to gather ideas on emerging challenges, new ideas and approaches related to UPE's areas of excellence. Participants of these seminars will be

[21] In close coordination with prospective analysis implemented by UPE laboratories and other research teams.

internal and external experts from science, private companies, NGOs, administrative bodies and local politicians. This will especially leverage the Institute of Sustainable Metropolis[22] located close to UPE.

- Systematic surveys of internal and external experts using the Delphi methodology[23] to identify key challenges in terms of their potential impact on future society and economy.

3.1.2. Phase 2: Capability review

The capability review will identify strengths and weaknesses of UPE's on its excellence perimeter. The objectives, scope and process of this evaluation is set out in detail in section 4.3.

3.1.3. Phase 3: Prioritization of key challenges

Building upon the results of the prospection and capability review, the objective of phase 3 is to select or prioritize the identified challenges with regard to the socio-economic implications and UPE's potential in terms of research, education and expertise. Based on expert analysis, the International Advisory Board will propose a list of priority challenges to the Steering Committee for decision.

3.1.4. Phase 4: UPE's strategic response

In order to enhance its impact at international level, UPE-Idex will focus its strategy on tackling the key challenges selected in phase 3. The strategic responses will leverage all knowledge based activities to bring solutions in the short, medium- and longer term. The table below shows the typical structure of strategic responses. The two tables that follow illustrate what potential UPE strategic response could look like for two hypothetical challenges:

- Increasing demand for sustainable transport models in urban areas
- Prevention of HIV and Hepatitis spreading in relation to the Labex Project Vaccine Research Institute

[22] This institute is the Paris region living lab on city issues

[23] The Delphi method facilitates the identification of converging opinions among a panel of experts through a multi-stage survey. At each round of the process, experts are provided with the results of the preceding one. On the basis of this information, they can decide to change their original answers or leave them unchanged. The final result is assumed to represent a more accurate representation of the group's vision.

The UPE Idex strategy focusing on the strategic responses to key challenges (illustrations below)

Impact's horizon	*Short term*			*Mid term*			*Long term*		
Activities	*Expertise*	*Training*	*Research*	*Expertise*	*Training*	*Research*	*Expertise*	*Training*	*Research*
General strategic objectives	Exploit oppor-tunities	Update /upgrade existing programs	Strengthen capabilities	Broaden service offerings	Create new programs	Develop new research with external partners	Consolidate client base in the long run	Reshape our education offer	Implement translatio-nal research
Challenge 1 *Sustainable transport*	*IEED Sustainable Cities*				*Labex Urban Futures and related Equipex*				
Challenge 2 …									
…									
Challenge N	*Response N*								
Relevant Idex levers	• UPE experts • IEED • Advancity	• Call for Proposals • Health School • Urbanism institute • Lifelong UPE	• Research Call for proposals	• IEED • Labex • Advancity	• Labex training programs • Call for proposals • Health School • Urbanism institute • Lifelong UPE	• IEED • Labex • SATT	• IEED • UPE experts • Advancity	• Health School • Urbanism institute • Advancity • IEED	• Labex • Research call for proposals • SATT

Illustration for challenge 1: UPE's response to the increasing demand for sustainable transport models in urban areas with the *IEED Sustainable Cities* and the *Labex Urban Futures*

Short term			*Mid term*			*Long term*		
Expertise	*Training*	*Research*	*Expertise*	*Training*	*Research*	*Expertise*	*Training*	*Research*
Exploit opportunities	**Update /upgrade existing programs**	**Strengthen capabilities**	**Broaden service offerings**	**Create new programs**	**Develop new research programs**	**Conso-lidate client base**	**Reshape our education offer**	**Implement translational research**
Ad hoc consulting services on interactions between urbanism and public transports and infrastructure	Strengthen existing interdisciplinary programs (e.g. UPE's Masters in Planning, Urbanism and Transport) and foster their cooperation with environmental sciences	Exploit living labs to facilitate cooperation between academic research and non academic RD activities Further strengthen the role of UPE's doctoral "City, Transport and Territory" Modelisation of shared transports effects	Elaborate prospective studies on urban and inter-urban transport and their influence on socioeconomic development and the environment Services on shared transports simulation	Create joint European Master programs on sustainable urban development incorporating courses on transport and mobility Create inter-disciplinary summer schools for PhD students and young researchers	Interactions between transports and distance working	Draw from research results to strengthen capacities of modeling applied to urban planning, infrastructure construction, transport regulation	Trainings on urban quality and integrated environment services	"Decompartmentalize" modelling approaches by combining physical air and water parameters, urbanisation choices and transport models. The City, Planning, Architecture and Transport digital archives will help point up long-term trends and past multi-disciplinary overlapping. Include NGOS citizen associations in research programs

IEED Sustainable Cities *Labex Urban Futures and related Equipex*

Illustration for challenge 2: UPE's response to prevent HIV and Hepatitis spreading in relation with the *Labex Project Vaccine Research Institute (VRI - Labex project)*

Short term			*Mid term*			*Long term*		
Expertise	*Training*	*Research*	*Expertise*	*Training*	*Research*	*Expertise*	*Training*	*Research*
Exploit opportunities	**Update /upgrade existing programs**	**Strengthen capabilities**	**Broaden service offerings**	**Create new programs**	**Develop new research with external partners**	**Consolidate client base in the long run**	**Reshape our education offer**	**Implement translational research**
Biological and genetical analysis contributing to clinical trials performed by pharma companies leveraging the immuno-monitoring platform	Conferences by VRI guest researchers in UPEC's immunology master	Senior chairs, post-doc grants, investments to develop the immuno-monitoring platform	Consulting services for new prevention strategies in order to valorize applied research Enlarge scope of biological and genetical analysis outsourced to the VRI thanks to upgraded immuno-monitoring platform	Create a Master 2 in vaccinology (both professional and research-oriented) Create an interdisciplinary Master in Health and Communication Organize a yearly symposium on Immunology & Vaccinology	Applied research on the effectiveness and efficiency of prevention campaigns Leverage expertise based relations with business to develop research partnerships (clinical trials phases 2 and 3)	Develop new services according to scientific discoveries and business demand	Create a quality charter for VRI accredited courses at national level in order to enhance the excellence of VRI's education and training standards	See VRI's research program to develop effective vaccine candidates against HIV and HCV

3.2. *An internal call for proposals to mobilize UPE research potential on strategic challenges*

Over the past decades, UPE's founding members have developed world class programmes in UPE's areas of excellence. These programmes are implemented in cooperation with a wide range of partners at the local, national and international level (see section 2). The Idex strategy aims to strengthen the current research activities while introducing new mechanisms that will help UPE to tackle the key challenges identified through the emergence platform.

As described above, the "excellence perimeter" is characterized by a network of highly dynamic interconnections between major research areas. As the challenges are constantly evolving, there is a need to provide research teams with fast, flexible and unbureaucratic support in order for them to respond to these challenges in a timely and relevant manner. Thus, UPE will launch periodic calls for proposals to foster innovative research projects, which are not eligible to financial support by established funding institutions.

The volume of funding will be flexible according to the projects. The objective of the projects shall be to become self-sustaining and/or largely supported by external funding by the end of the initial funding period. Funding periods will vary, typically ranging from two to five years. All UPE and associated researchers are entitled to propose research projects.

Projects will be selected in two steps. First, all submitted projects will be evaluated by an internal jury composed of a panel of UPE senior researchers. As international experience of intramural calls for proposals has shown, this preparatory phase is important to ensure decisions are taken in a timely manner[24]. In a second step, the internal panel elaborates a list of priorities which is submitted to the International Advisory Board for final decision.

The following criteria will receive particular attention in the selection of projects:

- Relevance with regard to UPE's strategic responses as elaborated through the emergence platform;
- Interdisciplinary approach: project teams should include researchers with a variety of academic backgrounds and set out a clear strategy of how to exploit synergies between the relevant disciplines and manage potential risks;
- External cooperation: the project teams should cooperate with external partners (universities, private and/or public sector organizations), thus strengthening UPE's position and strengthening its partnerships on the issues at stake;
- Role of young researchers: project teams should pay particular attention to the role of young researchers. A limited number of Post-doc and/or PHD students should be

[24] See for example the analysis of intramural funding mechanisms in German "Excellence Clusters" (Sondermann, M. et al.. : *Die Exzellenzinitiative : Beobachtungen aus der Implementierungsphase*, iFQ-Working Paper No. 5, Dezember 2008)

associated to the projects. Smaller projects can also be entirely managed by young researchers;
- Potential to obtain external funding at the end of the initial funding period.

The funding will primarily focus on recruiting international researchers and enable UPE distinctive researchers to commit more time to research by discharging them of some teaching responsibilities. The ambition is to attract high potential researchers and future talents, nationally and internationally (see section 4.2 on the Human Resources strategy). Thus, the best projects will be granted Project Chairs offering internationally competitive resources and conditions in an interdisciplinary environment. The scale of the Chair (number of scientists, level of seniority and funding period) will be flexible according to the needs of proposed projects. The selection process of Heads of Chairs will be highly competitive. Project chairs will receive high quality administrative support and will be assisted by fundraising experts in order to facilitate access to longer-term external funding.

Funding will be concentrated on the "excellence perimeter". However, 25% of the funds will also be allocated to project teams working outside the "excellence perimeter", yet only on issues directly related to the UPE's key challenges. The Idex strategy aims to obtain a maximum leverage effect. Thus, funding of UPE's calls for proposals will be systematically complemented by member institutions with a 1.5 to 1 ratio (see section 5).

3.3. *An internal call for proposals to accelerate the adaptation of UPE's education portfolio to meet its strategic challenges*

As described in section 2, the cooperation between UPE members has helped them develop high-quality interdisciplinary teaching and training programs in the areas of excellence. It is vital to the UPE Idex strategy to accelerate this transformation process and to further renew its education portfolio.

Thus, UPE will support coordinated initiatives from members to upgrade existing training programs and to create new ones. This will enable UPE to respond to key challenges in a timely manner and expand its reach beyond national borders. Criteria will be:
- Contribution to UPE strategic responses
- Potential to enhance UPE's attractiveness especially at international levels. Our common goal is to develop European masters.
- Interdisciplinary approach
- Innovative pedagogical approaches
- Vocational dimension.

Measures financed may typically include:

- New interdisciplinary programs established in cooperation between UPE member institutions and/or with external partners, especially non-French academic institutions
- Sabbaticals for international professors or professionals for a period of one week to one semester or a series of distance conferences with high level professors or professionals
- Salaries/benefits of external teachers
- Ad hoc conferences and seminars in cooperation with external partners
- Distance learning equipment to facilitate the implementation of double-degrees between UPE members
- Summer schools specially in ours areas of excellence

The selection process will be similar to that of the call for proposals on research described in section 3.2.

3.4. *Sys.Com@UPE : an integrating platform to foster analysis and modelling of complex systems*

The interdisciplinary challenges of the Idex address generally implicate complex systems, whether urban, social, economic, environmental, biological or genetic. Given the key role of nonlinear interactions in these systems, one cannot be satisfied by an improved understanding of their parts without integrating their modeling to get the whole. These systems are symptomatically characterized by extreme variability over wide scale ranges, nonlinear responses, high dimensional and noisy attractors, etc. It will be applied for instance to an applied mathematics corpus on risks (uncertainties, stochastic modelling), and multifractal analyses and simulations, multi-process and multi-scale approaches in environmental physics and bio-chemistry, e.g. nonlinear diffusion of chemical and biological contaminants, complexity of social networks, their links to disease propagation, health and air/water quality, mobility technologies, especially on autonomous vehicles (sensors and analysis, decision tools, security impacts)

Thus, UPE support the development a pilot integrating platform Sys.Com@UPE to foster analysis and modeling of complex systems within the excellence perimeter. This platform will be developed in the framework of « Creative Commons » licences and along two complementary and interacting axes:
- a digital research institute (Sys.Com.NRI@UPE) to share data and computing protocols, to develop ubiquitous computing, sophisticated platform networking, e-publications,
- a digital university (Sys.Com.NU@UPE) with e-evaluation and e-curricula of students, a self-adaptive media library, dynamically selected course materials, wiki-tools.

The corresponding transdisciplinary research and training will be gradually structured in the framework of a Chair on Complex Systems and their development will take hold on the integrating platform that will foster both internal and external collaborations.

3.5. *A foundation to leverage on external resources*

As mentioned previously, most of the research projects will be co-funded by socio-economic partners. In order to facilitate such contributions, a foundation will be created thus allowing the support of projects that do not include ENPC and its foundation. Donors to this foundation will benefit from significant tax cuts that amount to an average 60% on corporate taxes.
In most cases grants will be allocated to specific projects. In the longer term, the foundation will be UPE's main fundraising tool vis-à-vis its business partners, local authorities and alumni.

3.6. *Create new structures that underpin UPE's teaching excellence*

The UPE's financial supports will boost existing training programs and create new ones through an organic bottom-up approach. This will be complemented by the organization of learning through two new structures consolidating teaching capabilities of members in UPE's areas of excellence. They will offer greater visibility to UPE programs, enhance flexible pathways between them and generate new opportunities to develop interdisciplinary programs. Similarly co-operation between members of UPE in technological bachelor's courses will aim to raise the profile of this sector in UPE's teaching to potential students and the learning pathways made available to them.

3.6.1. Creation of a Health school ("Ecole de Santé")

The creation of a UPE university Health School intends to seize three major opportunities:

- **Enhance UPE's training capabilities in an ever expanding sector**: There is a growing demand for professionals with health skills, whether as a specialism or as part of a dual qualification, for example with business studies. Demand is driven by an ageing population, the importance of preventative approaches to medicine and rising expectations from citizens about the local services available to them. Evolution in technologies and practices has also raised demand for lifelong learning.
- **Anticipate structural changes in health education**: medical courses are traditionally organized by discipline with a very high failure rate at the end of year one, seen as a "lost" year for many unsuccessful students. National work is underway to re-engineer medical and paramedical training courses, transforming them into university paths and raising compliance with the LMD ("Bachelor, master, PhD") system of university qualifications. The first step will be the introduction of a common first year medical course across different disciplines (medicine, pharmacy, physical therapy, occupational therapy, midwifery, odontology). 20 professions are concerned.

- **The original association of the medical school of UPEC, the National Veterinary School of Alfort (ENVA), and safety agencies (INVS, ANSES)**, all at close proximity.

- *A strong record in research and training in health and medical sciences*

UPE has a strong base in the health sector in Créteil's area: in addition to the medical school based at the Mondor hospital, UPEC offers a wide range of training courses linked to health professions: nurse and midwifery training programs, veterinaries, engineers in biomedical and health sciences at ISBS (Paris Superior Institute of Biosciences). Interdisciplinary links already exist between the health sector and other disciplines : engineering (partnership between life sciences of UPEC and ESIEE School), environment, Sciences and techniques of physical and sports activities (STAPS), sanitary and social sector, tourism, biology, management sector (common masters with the Montsouris School of health managers), or between human and social sciences at UPEMLV and nurse schools.

- *The creation of the Paris East School*

Within this context, the creation of the UPE Health School is an opportunity to reshape the training offer. Health schools exist in many countries, for example the Harvard school of public health is structured in several multidisciplinary departments: "Global health and population", " Health policy and management", " Society, human development and health".

This project responds to several objectives:

To coordinate all UPE's training in health: First of all, the UPE Health School will bring together and coordinate all health and medical related courses in UPE, including lifelong learning, and also expertise. It will market courses under a single "brand" and provide a single entry portal offering access to all the courses available, in medical school, but also in management, law departments and other faculties.

It will be structured by professional departments that will each be in charge of a specific curriculum (medicine, nursery, midwifery…). Flexible pathways will be developed and some courses will be mutualized in order to develop a common culture and understanding of health services. A department will be dedicated to developing multidisciplinary Masters courses linked to the health sector.

The Health School could structure courses in 11 innovative training streams: 1. Biology and health, in partnership with ENVA; 2. Law and health; 3. Environment, town-planning and health; 4. Tourism and health; 5. Sport and health; 6. Economics and health; 7. Managing health services; 8. Migration and health; 9. Training of administrative health personnel (in partnership with IFSI); 10. Training for engineering professions linked to disability or ageing (in partnership with ISBS); 11. Training for professions linked to cellular therapy (in partnership with EFS), etc.

To introduce a health dimension in other Masters: Work is also underway to create new interdisciplinary courses in the health sector linked to disciplines such as Urban development, Environment and Sports within UPE. The objective is to complete the administrative processes for these new master's degrees by October 2013, so as to be ready for AERES evaluation in 2014 and implementation in 2015. These new Masters would also have a strong research dimension, in order to lead some students to PhD.

To increase multidisciplinary approach in research: The Health school will also allow the development of a research strategy based on a multidisciplinary approach including UPEC and UPE MLV and the "écoles" of Paris-Est. In particular, ENVA and ANSES will be part of the Health school.

To develop health training in Seine-et-Marne: The Paris-East Health School also aims to increase the training offer in health on the whole territory of UPE, especially in Seine-et-Marne, the poorest area in health services of all Ile-de-France. The first stage will be the progressive implementation of a 3-year health degree ("licence") on a three year timescale at Val d'Europe with clear pathways for potential students. This project could be achieved thanks to a partnership with the Disney Corporation, which is currently under consideration since the Val d'Europe Campus will be built close to the EuroDisney Park. Disney has expressed an interest in participating in projects linked to health in the department of "Seine and Marne". The clusters of competitiveness Advancity and Medicen are also potential partners. The first student intake (150-300) could start their courses in September 2011 in Val d'Europe. In 2016, there should be about 1050 students in medicine courses in Val d'Europe, and 150 research and teaching hospital staff.

- *Bringing benefits for students, researchers and the local populations*

The creation of the Health school will bring significant benefits for students, researchers and the local populations:

- First, student choices and success rates will be improved through greater flexibility and increased pathways between different health courses. The common first year medical course will support equal opportunities on the territory by offering a local route to young people to enter a prestigious and growing sector.
- Second, the 11 innovative training streams fit the emerging needs and professions in the health sector often at the junction of several existing disciplines.
- Third, the Health school will strengthen the links to the local economy through lifelong learning and "sandwich courses" in "Val de Marne" and "Seine et Marne".
- Finally, it will increase the visibility and originality of UPE in health sciences with a medicine faculty at the core.
- **The original association of the medical school of UPEC, the National Veterinary School of Alfort (ENVA), and safety agencies (INVS, ANSES)**, all at close proximity, allows UPE to implement the concept "One World, One Health" in France, especially in the fields of infectious diseases, health safety, cardiology and animals models of human diseases.

3.6.2. Consolidate the training offer of two urban institutes bringing together the French Urban Institute and the Urban Institute of Paris

The primary objective of the Idex action Urban Institute will be to develop a set of coherent training courses in urban studies. Although organized as a federation, the collaboration within the Urban Institute will aim to raise the visibility of its training courses on offer within France and internationally.

The Paris Urban Institute (IUP to UPEC), with almost a century of history, and the French Urban Institute (IFU to UPEMLV) are the two most important institutes in France in this sector. Each institute has 25 tenured staff and about 250 Masters students. IFU is centered on human and social sciences, while more scientific courses exist in other entities at UPEMLV in the field of urban development.

The training courses from IFU and IUP will be reviewed and adapted. This initiative has already started at Master's level, with work underway to offer a common first year for Masters students, and then a single portfolio of courses through 6 to 7 specialist subjects. Courses will be specifically developed to attract international students and some will bring together health and science issues at the heart of the excellence perimeter. A unique web portal will be created to communicate and present this training offer.

The Urban Institute will offer sabbatical opportunities to international researchers to attract excellent researchers who will provide exceptional training opportunities for students. The creation of this sabbatical and seminar programme will help to build brand awareness internationally. Consequently, the Urban Institute will look to develop courses specifically for international students. A communication strategy will be defined and implemented.

In the context of the development of this project opportunities will also be explored for greater collaboration between the training courses offered by the Urban Institute and other courses provided by other UPE members, including ENPC, UPEMLV and EIVP as well as the three schools of architecture and the CSTB. Intense collaborations already exist between the two universities, the ENPC and the architecture schools, for example the "Mobility and transportation" Masters course already delivered by UPEC, UPEMLV and ENPC.

The financial support by UPE's on training programs (see 3.3.1) will also be used to identify new courses, for example bringing together urban development and health or the environment. These topics will be identified in the framework of the strategic responses to key challenges developed by the emergence platform.

3.6.3. Build a coherent set of technological courses at bachelor level and pathways to opportunities for further study in UPE

At Bachelor (and DUT) level the UPEMLV, UPEC and their IUTs offer a wide range of technological courses. For example the UPEMLV offers 14 different "general" bachelor's degrees and more than 50 vocational bachelor's degrees, of which half are delivered by the

IUT. These courses are vocationally focused and have good job entry outcomes. They often incorporate work experience as an integral part of the educational experience. Although links do exist between Bachelor's and Master's courses between different members of UPE they are more the exception than the rule.

The "Initiative d'excellence" provides the opportunity to simplify the training offer at bachelor level providing greater visibility to students on the courses offered at UPE. In addition a review of technological courses at bachelor's level will encourage certain young people to have ambitions beyond an initial degree, supporting equality of opportunity and avoiding unduly compartmentalizing general and vocational training courses.

Therefore the UPEMLV, UPEC, and their IUT will work together over the next few years to map out the existing technological and vocational courses at bachelor level. They will then seek to align this mapping with the current and future needs of business and the requirements to enter courses at Masters level within UPE in collaboration with the ESIEE and ENSG. Using this analysis the members of UPE aim to re-shape the offer to students helping clarify the courses available, their outcomes in work or in terms of further study, and the routeways to them.

UPE will consider the opportunities for bridges between vocational courses, including "licences professionnelles" at the Bachelor's level and more advanced highly-rated research degrees. This approach will seek to offer students starting a course a full range of opportunities for after three years study to enter work or go on to further study at Masters level.

For example collaboration is already underway between the IUT of UPEC and Ingénieurs 2000 of UPEMLV to develop a partnership that offers students a clear pathway from an IUT in UPEC to an engineering school degree at UPEMLV. The ENPC also works with the universities to consider what opportunities can be made available to a select group of excellent students from scientific bachelor's courses to help them achieve admission to its engineering course. ESIEE and UPEMLV organize each year together a Forum for candidates to apprenticeship in engineering. Companies are invited to meet candidates offering them part-time roles during their studies.

UPE will also consider how to build upon existing relationships between the IUT and the business school IAE of Créteil or UFR Economie-Gestion at UPEMLV that enable bachelors students to access masters courses in business, economic and management across several different establishments. One possible approach that will be considered would be the creation of a management school at the level of UPE.

3.7. *Build on established excellence in lifelong learning helping highly-skilled professionals thrive and offering in-work and first-degree professional courses to help everyone realize their full potential*

Lifelong learning is of increasing importance for local and national economic success. It is key to helping economic growth both in industrial and tertiary sectors and individuals to thrive in a labour market that expects regular career evolution and progression.

For UPE members and their subsidaries lifelong learning is an important source of external revenue. It is also the guarantee of a training offer that fits businesses needs and enables the design of training courses to be aligned with real –world issues. Within this context lifelong learning is a key component of the training responses that UPE can identify to future challenges within the emergence platform (cf. 3.1 above). Through the emergence platform and other activities in this area UPE aims to develop executive education activities with French and international companies in the excellence perimeter, adding further value to the sector and increasing revenue from.

The objective is to develop short training courses leading to a qualification within the framework of "Individual Right to Training", as well as training plans for companies. The objective is to increase by 30% the total number of trainees and the income accordingly. In addition its approach to lifelong and in-work learning will contribute to giving everyone the opportunity to realize his potential (equality of opportunity).

3.7.1. World-class executive and scientific training for industry in the excellence perimeter

Within the excellence perimeter the members of UPE offer world-class executive and technological training.

For example in the area of urban areas, the environment and related engineering sciences:

- The ENPC provides training to 8000 adults, the majority on short courses. It also offers seven post-masters courses and one of the top 20 MBAs in Europe in collaboration with international business school partners. The ENPC has a school of international management making 2M€ income in France and 4 M€ in joint ventures
- The ESTP offers more than 120 short courses, eight specialized executive masters courses for experienced professionals and provides operational training in site management and project management to a select group of 30 students per year
- The EIVP provides more than 20 courses in sustainable urban development
- UPEMLV, in cooperation with ENPC and Cergy Pontoise university, offers the specialty "Services to environment management" of the master "urban engineering" in lifelong training, in cooperation with Veolia

In the area of health and society:

- The ENVA trains more than 500 veterinary professionals per year either on short courses or one of 15 courses leading to formal qualification
- At UPEC all Master's courses are open for lifelong learning students and for some Masters, for example a joint Master UPEC / *Ecole Supérieure Montsouris* "Management and Health" a few groups are exclusively dedicated to lifelong learning. In addition partnerships with the region already exist with two Masters courses (computer sciences and distributed systems engineering) and five vocational courses at bachelor level under development.

In order to further grow these activities the institutions will look to invest in a coordinated way through:

- the design of new courses to meet one of more of the following criteria:
  - specifically attractive to international students and businesses;
  - at the junction of **cities, environment and their engineering sciences** with issues of health and society; or
  - addressing skills needs in the public or private sectors for the local area.
- improved communication and marketing at the level of individual institutions but looking to build brand recognition for Paris-Est on the excellence perimeter
- investment in the quality of facilities offered for lifelong learning: classrooms, digital learning environments, accommodation, etc.

The Initiative d'excellence will accelerate the expansion of these activities with positive spillover effects in linkages between industry and the university institutions. These investments should also bring in revenue relatively quickly for the members of UPE.

3.7.2. Commit lifelong learning to local development

The second major project is a collaboration between UPEC and UPEMLV to re-engineer their relationship with businesses through a joint partnership office (maison des partenariats). It will provide a single point of contact for businesses with the two universities and collaborate with them in the development of lifelong learning and initial training courses, integrating best practice in the design and delivery of training. It will also assess the jobs and skill needs and help align the universities' training offer with the demand. This project is open to other institutions willing to participate, for example ESIEE. The working processes of this joint partnership office will be defined in 2011, for an implementation early 2012.

The "Initiative d'excellence" will enable this project to become a reality with a dedicated project manager and funds for communication and the development of new training offers with business. UPE expects that this project may also develop proposals that can be integrated into degree-level education within the universities.

This body will also develop partnerships with public sector bodies, and in particular look to work with the agency for jobseekers (Pôle Emploi) on an offer of training and support to those out of work, helping them to find a job and progress in work.

The UPE digital strategy, under development currently, will look to offer new learning environments both for students and the local population broadening the appeal of the HE courses and the methods of participating in them. In particular it will save students time in administrative activities, help them better manage their studies for other constraints and improve the information and communication on the support available to students to help them succeed in study and job entry.

For example the use of digital technologies will facilitate distance learning and provide additional support to help students who are falling behind. The site "Validexper" produced in collaboration with other Paris universities helps students to validate existing experience with a higher education framework.

3.8. *A coordinated effort to offer cutting-edge expertise and technology transfer in the excellence perimeter*

Many of the key challenges identified by the emergence platform will have medium- or long-term implications for the private and public sectors. The development and marketing of new services or technologies to these external partners is an integral part of the UPE approach to responding to these challenges.

3.8.1. The SAAT as a tool for transforming research results into technological and economic value

The SATT (Société d'accélération de transfert technologique – technological transfer acceleration society) brings together UPE PRES, Sorbonne Paris Cité PRES and Cergy Pontoise university. It will be an efficient tool to identify research results with high technological and economic potential. It will enable the transformation of research results into mature/developed technologies that are easily transferable to markets, or to position them directly in national or international patent pools. Its missions will range from detection of innovative results, patent hold and competitive management of patent portfolio, technological marketing and development of technologies before transfer by different processes (licence handover, company creation,).

With 7000 FTE researchers and 7500 PhD students, a portfolio of 584 patents and 217 exploitation licenses, the SATT innovation potential focuses on 4 economic sectors fully aligned with the Idex areas of excellence:

- Health (60% of developed technologies) and particularly activities linked to diagnosis and medical device, to biotherapies (vaccines, immunotherapies, cellular therapies), to telemedicine, to medical imaging and computer assisted surgery, to tools for drugs development (bio computer sciences, pharmacology)
- Environment, city planning and development (30% of developed technologies) and particularly activities linked to water and sanitation, waste storage and management

(including CO2), new energies and resources, sustainable production and energy of districts, sustainable construction, transportation and metrology

- Artistic and cultural patrimony and educational engineering are the two economic sectors in the area of soft sciences and should generate 10% of development projects

3.8.1.1. *A growing role for the UPE in offering expertise to the public and private sectors*

For UPE a growth in expertise will enable the member institutions to generate additional revenue as well as ensuring that the research is aligned with real-world problems.

For example in the area of the cities, environment and its technologies the creation of a joint venture between LCPC and Egis will be a catalyst for further expertise. Egis is the largest French company working in civil engineering with over 10 000 employees and over half its turnover relates to projects outside France.

The LCPC will initially hold 40% of the company "LCPC Expert", UPE 20% and the company Egis the remaining 40%. It will initially focus its activities in short- and medium-term on projects of expertise in the current areas of strength for the LCPC such as civil and structural engineering. As its business develops and new skills are acquired the scope of its offer of services will be extended progressively to more specific areas of sustainable development: environmental protection, energy efficiency, longevity of structures, reduction in the use of non-renewable natural resources, reduction in greenhouse gas emissions and protection of biodiversity. In the longer-term, and if successful, this organization could provide a model or a centre of expertise for the whole of UPE.

With the SATT focused on intellectual property and LCPC Expert on short-term expertise activities there is a clear distinction of roles but opportunities for collaboration. For example, LCPC Expert may have a role to play in the development phases in which the SATT budget and processes clearly require expertise for the development of prototypes, or the integration of specifications proper to the targeted market for the development of this prototype.

In the area of health sciences considerable research and expertise is already delivered by the ENVA particularly based on its particular biomedical research centre. ANSES is a key member of the UPE initiative to encourage greater expertise from its members. Common laboratories between ENVA and ANSES already exist, on animal health and zoonosis, and food safety. ANSES and InVS have ongoing collaborations and are increasing and strenghtening them (nutrition, biomonitoring, vector surveillance, food-borne infection and zoonosis). There are potential collaborations between InVS and ENVA relates to zoonosis.

Within the Initiative d'excellence the additional funds will enable further investment in training university teaching, research and sales staff in approaches to marketing, selling and delivering high-value service. It will also enable greater communication of UPE's value in

accelerating the growth of services and increasing the level of revenues. Finally it will enable the recruitment of a technical sales expert to develop the area of life and health sciences.

3.9. *The Equal Opportunities Institute*

3.9.1. Proven excellence in helping students succeed irrespective of their background

For the members of UPE, providing opportunities to all students irrespective of their background is a core part of their mission acting as a catalyst for the transformation of the region East of Paris. This commitment covers three main objectives:

- Encouraging more people from all background to enter higher education
- Providing a learning environment, training and teaching methods that enable everyone to fully develop and demonstrate their skills
- Supporting students to enter work and progress in work realizing their full potential

Lifelong and vocational learning are key in increasing opportunities for all, enabling many students to link work and further study with positive outcomes for their personal development. Students with work experience are also much more likely to enter work quickly. For example Master's students at UPEMLV without work experience the average time to find a job was 6 months compared to 3 months for those with work experience.

The universities and their IUT are leaders in France in the professional training opportunities they offer students. For example 7000 students, of which 5000 bachelor's students at UPEC, receive financial assistance.

These establishments have also had an important role in offer opportunities to recognize professional skills and competencies as part of obtaining an HE qualification (VAE). This approach ensures those with skills but without qualification have the opportunity to validate their knowledge and competencies.

The collection and analysis of data has also been key to the members of UPE approach to job entry. For over ten years the "Job entry observatory" (OFIPE) has been monitoring the student pathways and job entry statistics for UPEMLV.

3.9.2. Professionalise and develop UPE's approach to raise equality of opportunity through an equal opportunities institute

The individual members of UPE are already very active in these areas and the Initiative d'excellence gives them the opportunity to take this work to the next level. Scientists at UPEC and UPEMLV are already working in the field of educational sciences. For example in the REV team ("Reconnaissance, experience, valorization") attached to the Circeft laboratory (Paris 8). Many researchers from the IUFM also work on topics linked to education, and other UPE researchers work in the field of public policy and management of education.

UPE will develop a coordinated and structured approach to offering opportunities for all. The key catalyst for this will be the creation of an equal opportunities institute bringing together existing research teams and researchers related to educational sciences. The recruitment of a recognized expert in life chances and higher education will be one way to provide a focal point and leadership for this work.

The institute will assess international best practice including through the organization of several seminars on equality of opportunity in higher education. One crucial subject for the centre will be best practice in delivering more flexible approaches to the duration and structure of courses. Another will be the support and networks developed within the university life between students from different backgrounds and streams of learning. On the basis of this research the institute will develop proposals to 'pitch' to UPE members.

It will also develop a methodology for testing new and evaluating new approaches to accelerate the deployment of new techniques across UPE. The centre will work towards a set of equal opportunities principles applied across UPE. In the longer-term UPE will leverage the expertise and solutions developed for Paris-Est to provide expertise and potentially a chartermark to other institutions. In this way UPE will ensure that its best practice from is shared nationally as well as creating additional revenue.

3.9.3. Develop opportunities for greater communication with the general public on scientific issues in the areas of excellence

UPE will also consider how it can reinforce communication with the local and national population on scientific issues in the areas of excellence and their implications for society. This could build upon two main cultural projects: a digital project to showcase key documents on cities and health and sciences, coordinated by INA and ENVA; and the development, around the Fragonard museum at ENVA in Maisons-Alfort, of a cultural center with exhibition rooms, etc., which could be used by the whole UPE.

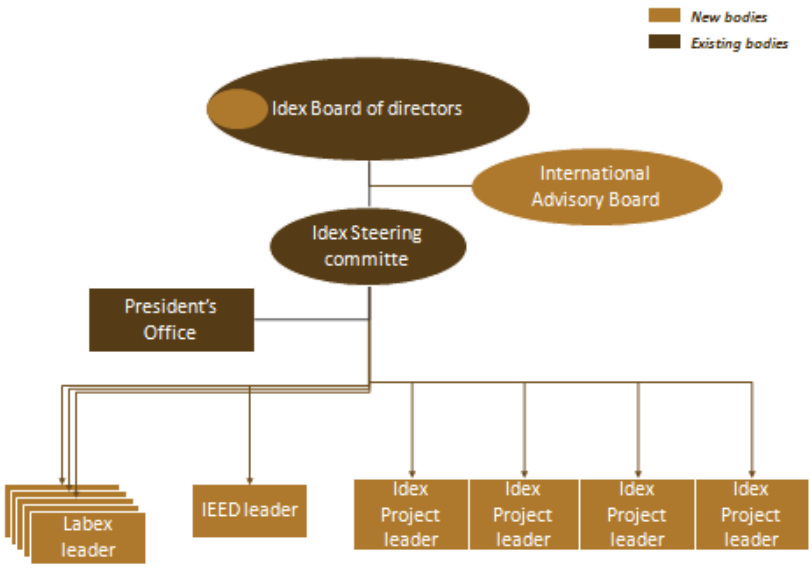
4. Governance and HR strategy

The Idex will be governed within UPE governance so as not to duplicate governance bodies and decision making processes. This is consistent with the strong implication of UPE in defining strategic priorities, structuring research and doctoral schools so far. UPE governance will be adapted according to the following guidelines.

4.1. *Governance architecture*

4.1.1. Global architecture

The figure below shows the architecture of UPE's Idex governance.



The main decision bodies (the board and the steering committee) are common with the PRES:
The **President** of UPE chairs the board, the Idex steering committee and manages the President's office. He ensures Idex coherence and represents UPE and UPE's members within the delegations it received from them. He represents UPE in the SATT and the IEED and coordinates reporting to the ANR and CGI. He is elected by the board by proposal of the Steering committee.

The **board** of directors, whose composition is defined in UPE decree, sets the Idex's Strategic Plan and its annual budget and programme. It validates the accounts and reviews progress each year. The board may set Strategic, HR and finance Committees in order to review the documents submitted to the Board by the Steering Committee beforehand

Besides, representatives from UPE's Labex, IEED and some Idex specific projects may be invited as experts by the president to the board sessions and participate in the debates in order to foster the coherence of the Idex, the fluidity and transparency.

The **Steering Committee** submits decisions to the board and is responsible for steering the Idex within the Board mandate. It reviews the budget submitted to the Board, the strategic plan and all decisions regarding the extension of the excellence perimeter. It is composed of UPE's President and the heads of the founding members. Associate members may attend the steering committee when needed.

The **International Scientific Advisory Board** evaluates the impact and progress of the strategic response in scientific and pedagogical terms and makes recommendations to the Board. It may be consulted on any issue or project within the Idex by the Board or the

steering committee. It gives its opinion to any significant modification of the strategic plan and the excellence perimeter.

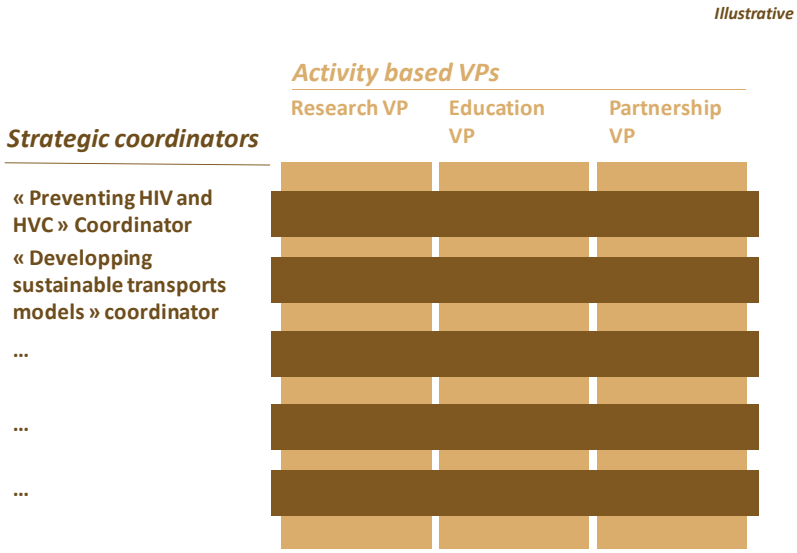
The Strategic orientation committee evaluates the overall impacts and progresses of the strategic orientations of UPE and makes recommendations to the Board.

UPE will consider the creation of an **academic senate** in order to foster academics' inclusion in the decision-making process and stimulate scientific and education coordination at PRES level.

The **President's office** prepares the Steering Committee's decisions and coordinates the implementation of the project. It consists of

- President
- Research Vice President
- Academic Vice President
- International relations Vice President
- Partnerships Vice President in charge of valorization, expertise and more globally relationships with local authorities and business
- General secretary of UPE

The president can invite the strategic coordinators if needed.



Strategic Coordinators will coordinate and supervise efforts on each strategic response elaborated and implemented in the frame of the Emergence Platform. This implies a coordination effort across UPE members and across activities (research, education, lifelong learning, expertise, valorization) on a specific challenge. They will be responsible for the coherence of the response and its effectiveness and efficiency. They will exploit potential synergies in cross-cutting activities. They will be highly respected figures of UPE with a well

balanced approach to all UPE activities. Labex or IEED leaders may obviously be well-suited for such functions.

The President's office prepares decisions for the steering committee and coordinates:

- Labex projects' leaders
- Equipex projects' leaders
- Idex specific projects' leaders (Emergence Platform, Project Chairs…)

Each year, the President reviews projects' implementation and submits a yearly progress review to the Steering committee and the Board. When necessary, he/she proposes corrective measures to the Steering committee.

4.1.2. Financial Decision Making

- *Financial governance*

The Steering committee prepares the Idex "simple budget". This budget allocates all resources coming from the IA programme and coordinated by UPE (i.e. Labex, Equipex, cohorts, IEED, Idex specific) and the corresponding resources to Idex projects. The President's office and the founding members' representatives gather project managers' draft budgets and challenge them when appropriate.

So as to enhance their impact and ensure Idex's consistency, **most Idex specific project** will be funded by dedicated IA financial resources and involved Members on **a 50/50 basis**. In order to enforce this rule and ensure equitable burden sharing, the President's office and the founding members representatives will consolidate at the same time the Idex total budget consisting of IA's, UPE funding and associate members and other partners' funds together with external resources. The "consolidated budget" will be reviewed by the steering committee. Members are supposed to make their best efforts to integrate these commitments in their own budgets.

The simple budget is adopted by the Board by proposal of the Steering Committee. The consolidated budget is reviewed by the Board. The consolidated budget is approved when all founding members approve their own financial commitments in it.

Both simple and consolidated Idex accounts are reviewed and certified by an external auditor. They are approved by the Board.

4.2. *International HR strategy: Accelerate the Attractiveness / Reputation virtuous circle*

4.2.1. Enhance UPE's international profile through HR strategy

Top research and higher education is a global talent activity. There is a growing competition between HERIs to attract high level researchers that will contribute to enhance the

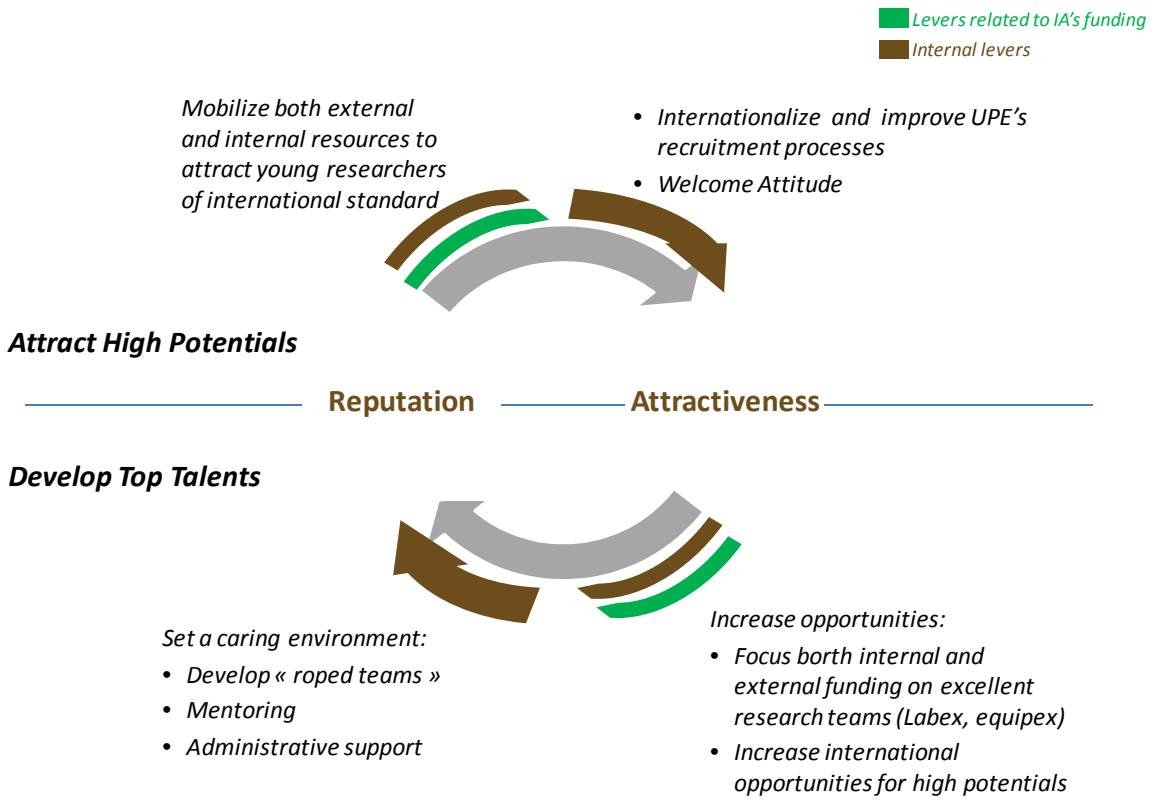
institutions' reputations and thus further strengthen their attractiveness. It is vital for UPE's Idex to accelerate this virtuous cycle.

In order to enhance UPE's international recognition, the strategic objective is to achieve an overall 25% of non French scientists on UPE's excellence perimeter in the next ten years

In general high potential researchers care about:

- The academic reputation of the research team or graduate school (for PhD students) with at least one internationally recognised scientist
- The international culture of the team and the environment
- The welcome package:
  - Salaries
  - Welcome solutions: work opportunities for the spouse, accommodation, solutions for children…
- The Research team's ambition and resources (platforms, research support…)
- Increased autonomy: for example through resources

As a result, UPE has identified key levers to accelerate this virtuous circle (see diagram below).



UPE's efforts will be focused on

- A few key figures that will enhance the international profile of research teams
- Post docs
- PhD students

Obviously, this effort will initially be limited to UPE's excellence perimeter.

4.2.2. Selective recruiting

In order to ensure its visibility at international levels, UPE will seek to achieve **a target ratio of 25% of non French research staff within its excellence perimeter.** This will be achieved through Project chairs but also through guidelines elaborated by the PRES regarding hiring on the excellence perimeter:

- Recruitment processes: international advertisements, international search and select committees (one on Health and Society.
- Welcome packages at senior, post doc and PhD level (for the President's list)
- Short term sabbaticals for non French senior researchers

In addition UPE will have a dedicate member of staff to make sure all provisions are made by host teams to ease non-French high potential staff's integration in the community (accommodation, administration, family support). A flexible funding mechanism will be put in place to ease the integration of foreign academic staff.

4.2.3. Developing talents

Developing talents is key to make sure UPE fulfils individual potential while enhancing its international visibility. There is a risk UPE's high potential staff may be targeted by academic or even business competitors making this issue of critical importance. Hence the importance of a caring and attractive environment. UPE will elaborate guidelines regarding:

- Autonomy for very talented young researchers
- Dynamic compensation policy in the long term
- Mentoring: mentors trained and selected, outside the team
- Lifelong learning to develop researchers' potential (networking, communication, languages, management…)
- Evaluation and feedback culture

A flexible funding mechanism will also be put in place in order to stimulate innovative initiatives by young high potentials with an international reach.

4.3. *Rigorous and transparent evaluation*

Each year the President's team will perform a **progress review** of both "*Investissement d'avenir*" projects and the implementation of Idex strategic responses.

The **capability review** mentioned in section 3.1.2 will be performed on a 5-year basis. It will be a comprehensive evaluation exercise on UPE's excellence perimeter and the related pull effect in other areas. It encompasses research, initial and lifelong education, expertise, HR strategy, internationalization, governance and steering mechanisms. Each evaluation is based on the previous Idex strategic plan. It will be based on the files compiled for the national evaluation exercise performed by AERES and its subsequent reports in order to fully exploit synergies with AERES' work. External experts will analyze strengths, weaknesses and identify potential threats and opportunities in the Idex excellence areas especially in comparison to international competitors. This evaluation process will abide by international standards including opportunities for feedback and contradiction between evaluators and evaluated teams. The experts will submit their analysis to the International Scientific Advisory Board that will submit its report to the Board of directors and suggest adjustments.

5. Means

5.1. *Key structural activities within the excellence perimeter*

5.1.1. Disclaimer and methodology

The total funding requirements are justified and described in three steps below:

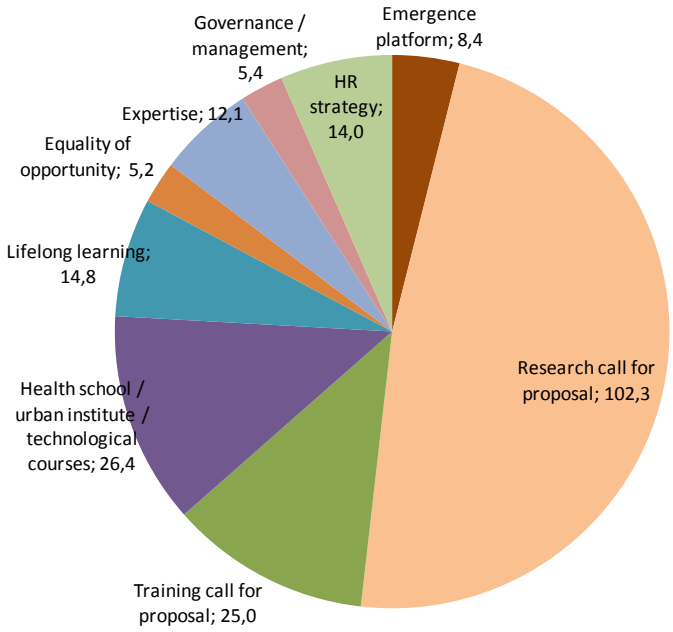
1. An approximate estimation of the total financial resources required to deliver each Idex action and a hypothesis on the proportion of these resources that will come from the *Investissements d'avenir* Idex call for projects and the proportion that will come from other sources of funding
2. The additional resources that have been requested within other Labex calls for proposals which are led by UPE and are in connection with this Idex
3. An assumption that the interest calculated on the financial donation can be applied using an estimated rate of 3,4% (rate applied for the Labex) which enables us to calculate the total financial amount of the UPE bid for the Idex

At this stage all these financial data are indicative. They will evolve as the details of the individual actions are clarified and the resources provided by the individual institutions are clarified. A more definitive financial budget and business plan will be provided in the next phase of the Idex process.

Document C presents a purely indicative allocation of the contribution of the different UPE institutions based on the relative size of their budget.

5.1.2. Justification of resources required by Idex action

The figure below shows a breakdown of Idex actions' 10 year budgets. Nearly half of this 115M€ budget is dedicated to the research call for proposals mostly dedicated to project chairs designed to implement UPE strategic responses.



The **emergence platform's budget** will fund the process of prospection (e.g. seminars and Delphi method), the capability review and strategic planning on a five-year cycle as well as the development of the **complex systems** platform. This action will be primarily funded by Idex resources with a contribution from UPE institutions, public and private partners.

The **research** will be funded at 55% by Idex resources with other contributions from UPE institutions, public and private partners. The education will be funded at 60% by Idex resources. 75% of the total resources on these calls for proposals will be allocated to the excellence perimeter.

The funding for the **Health School** relates to investment / equipment (facilities, relocalisation and sharing tools), the initiatives to develop the school (communication, governance) and activities to create new training courses or pathways across curricula. The split between Idex and UPE own resources for this project is estimated at 50%/50%.

The coordination of training linked to the **Urban institute** will cover international sabbatical opportunities, communication activities and the development of new courses. The resources for this project are shared equally between the Idex resources and UPE institutions.

The action to improve the **coordination of technological courses** at bachelor's level cover a project manager, communication activities and the development of new courses. The resources for this project area shared equally between the Idex resources and UPE institutions.

The actions related to **executive lifelong learning** are based around a flexible funding model for improving the quality of facilities (digital technology, classrooms, etc.) the development of new courses and improved communication. The resources for this action are initially shared between Idex resources and UPE institutions. This action is expected to raise revenue for UPE and therefore over a five-year period the Idex contribution is projected to decrease to zero. The additional funds and any profits are reinvested in the research call for proposals.

The other actions related to the **partnership office** between UPEC and UPEMLV financing a dedicated project manager and communication activities. They will be funded 50:50 between Idex resources and UPE institutions.

The actions related to **expertise** will fund improvements in skills and competencies of UPE staff in marketing and sales approaches. It will also enable improved communication and the recruitment of an expert to develop expertise around the pole of health and society. This action is expected to raise revenue for UPE and therefore over a five-year period the Idex resources are projected to decrease to zero. The additional funds and any profits are reinvested in the research.

In the area of **equal opportunity** the Idex will fund a project manager, expert and administrative support to coordinate the development of the equal opportunities institute with funds also foreseen for seminars. The resources required for the project will be provided equally between UPE institutions and Idex resources.

For **governance** the Idex project will include the mobilization of project managers and strategic leaders to help manage and drive forward the Idex. It will be funded solely from Idex resources.

The **HR strategy** will provide a project manager and flexible funding to develop attractive "welcome packages" for international researchers as well as a funding pot for excellent PhD and post-doctoral students to enable them to develop autonomous projects. The resources for this action will come equally from Idex resources and the UPE institutions.

UPE is all the coordinator for five Labex, which are all in the area of excellence of this Idex:

- Urban Futures
- MMCD
- Bezout
- VRI
- SITES

Over a ten-year period these Labex have requested a contribution from « Investissements d'avenir" calls for proposal of 35.45 M€.

The total funding requested for this Idex over a ten-year period reaches a total of 150.3 M€ corresponding to the revenues of a 442 M€ endowment.

5.2. *Detail of budget breakdown by resources types, excellence perimeter and pull effect*

As set out above, more than three-quarters of Idex funds will be dedicated to UPE's excellence perimeter and even more in terms of total budget.

Table 1: 10 year budget of Idex on the excellence perimeter (M€)

Action name	Resources				Costs		
	Idex funding	**Other funding Inv. d'Avenir**	**Contribution from Idex partners on their own budget**	**External resources**	**Inv. incl. real estate**	**Working costs**	**Person-nel**
Emergence platform	8	0	0	0	0	4	4
Research funding	46	0	20	10	27	14	36
Education funding	11	0	8	0	8	4	8
Health School	8	0	8	0	4	2	10
Urban institute	2	0	2	0	1	2	2
Techn. courses at bachelor level	1	0	1	0	2	0	0
Lifelong learning	1	0	4	3	5	2	0
Equality of opportunity	1	0	1	0	1	1	1
Expertise	1	0	1	7	5	3	2
Gov. and mgmnt	4	0	0	0	0	1	3
HR strategy	5	0	5	0	0	0	11
Total (Labex excluded)	**88**	**0**	**51**	**21**	**52**	**32**	**77**
Labex 1 : Futurs Urbains		8	364	0	31	179	224
Labex 2 : MMCD		7	217	0	2	1	4
Labex 3 : Bézout		4	134	0	0	70	90
Labex 4 : VRI		8	19	0	6	103	80
Labex 5 : SITES		9	36	0	0	91	111
Total (Labex included)	**88**	**35**	**821**	**21**	**91**	**476**	**586**
% on excellence perimeter	77%	100%	98%	71%	81%	98%	96%

Table 2: 10 year budget of Idex dedicated to the pull effect (M€)

Action name	Resources				Costs		
	Idex funding	Other funding Inv. Avenir	Contribution from Idex partners on their own budget	Ext. resources	Inv. incl. real estate	Working costs	Personnel
Emergence platform	0	0	0	0	0	0	0
Research funding	15	0	7	3	9	5	12
Education funding	4	0	3	0	3	1	3
Health School	0	0	0	0	0	0	0
Urban institute	1	0	1	0	0	1	1
Techn. courses at bachelor level	1	0	1	0	2	0	0
Lifelong learning	1	0	4	3	5	2	0
Equality of opportunity	1	0	1	0	1	1	1
Expertise	0	0	0	2	2	1	1
Gov. and mgmnt	1	0	0	0	0	0	1
HR strategy	2	0	2	0	0	0	4
Total (Labex excluded)	**27**	**0**	**18**	**9**	**21**	**10**	**22**
Labex 1 : Futurs Urbains	0	0	0	0	0	0	0
Labex 2 : MMCD	0	0	0	0	0	0	0
Labex 3 : Bézout	0	0	0	0	0	0	0
Labex 4 : VRI	0	0	0	0	0	0	0
Labex 5 : SITES	0	0	0	0	0	0	0
Total (Labex included)	**27**	**0**	**18**	**9**	**21**	**10**	**22**
% on excellence perimeter	23%	0%	2%	29%	19%	2%	4%