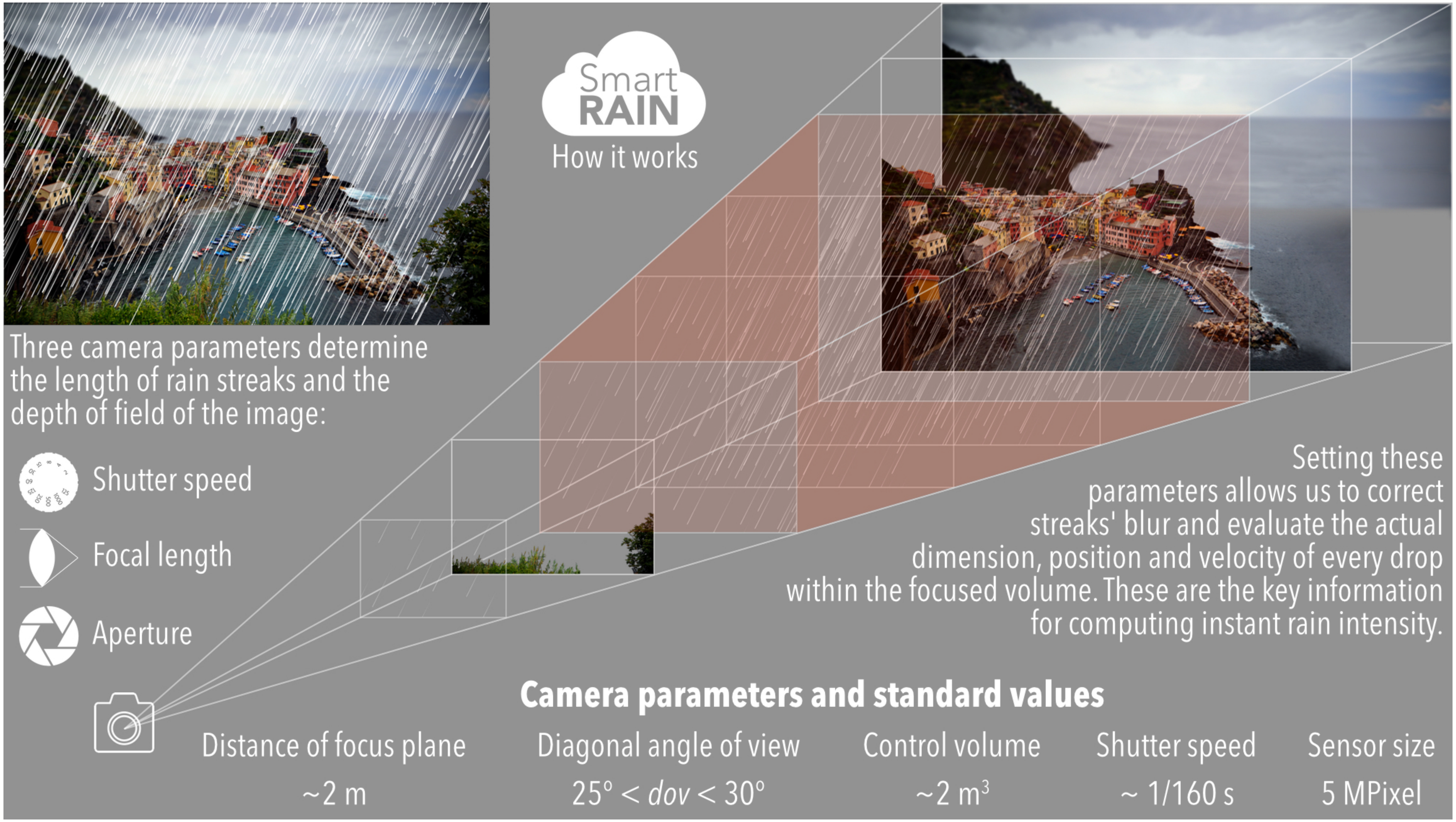
waterview

SmartRAIN:
an IOT-based solution for real time rain mapping



waterview

Storia del progetto

Giugno 2015

1° submission

Open disruptive innovation

9.91

Storia del progetto

Giugno 2015

1° submission

Open disruptive innovation

9.91

Settembre 2015

2° submission

Inclusive societies

13.32

Storia del progetto

Giugno 2015	Settembre 2015	Febbraio 2015
1° submission	**2° submission**	**3° submission**
Open disruptive innovation	**Inclusive societies**	**New business models**
9.91	**13.32**	**13.82**

waterview

Storia del progetto

Giugno 2015	Settembre 2015	Febbraio 2015	Giugno 2015
1° submission	**2° submission**	**3° submission**	**Project start**
Open disruptive innovation	**Inclusive societies**	**New business models**	
9.91	**13.32**	**13.82**	✓

waterview

Storia del progetto

1. Excellence

1.1 Objectives

The far-reaching objective of this project is to integrate traditional at-ground rain gauging systems with optical low-cost systems, with the ultimate aim of improving the spatial resolution of the current terrestrial rain-gauging networks and their capacity to map rainfall patterns at the ground.

Capturing rainstorm patterns in real-time with adequate spatial and temporal resolution is currently prevented by the sparseness of terrestrial rain-gauging networks and by the coarse resolution of both weather radar and satellite images. Damages caused by unobserved/improperly-managed rainstorms are huge. Insurance companies estimate yearly overall losses due to severe storms in Europe in about 5-8 billion EUR, while 400 billion US$ in damages are estimated annually in the US, based on US National Weather Service data [1]. Damages are expected to increase in the next decades, following the predicted increase in the frequency of heavy rainfall events at global scale [2]. Since the costs for repairing damages are estimated to be about 6 times higher than the cost of adaptation, the market for technologies to adapt to climate change is rapidly growing in Europe and worldwide.

Water for food production already accounts for about 70% of global freshwater withdrawals. Estimates show that 45% more agricultural water will be required by 2030 to feed 8 billion people [4]. Meeting the growing need for actionable hydrological information using increasingly sophisticated technologies does represent the main avenue toward a high return on investment in managing water resources to ensure collective water security.

Within this general context, our project investigates the technical and economic viability of a novel solution for monitoring rain at the ground. The system is designed for being composed by i) a hardware module for acquiring images during rain events and either processing or sending them to a cloud-based service; ii) a software module (i.e., the SmartRain algorithm) which stores and processes the registered images to derive quantitative rain rate measures. The SmartRain algorithm is patent pending since January 2015; an experimental proof a concept of the technology is presented by [3]. We are currently validating the technology in the lab and in the real environment (with low cost sensors under real rain conditions). Some technical detail about the overall idea, ground principles and technology are reported in Figure 1.3a.

The objectives of the feasibility study are listed herein, in a chronological order:

a. Prototyping the system as a stand-alone sensor;
b. Testing the system portability to non-dedicated cameras;
c. Exploring the market: volumes, geographical areas, trends, segments, barriers;
d. Identifying a cost-effective technological proposition for the market;
e. Defining the value proposition(s);
f. Demonstrating the system in the relevant environment;
g. Defining a go-to-market strategy.

1.2 Relation to the work programme

The project is framed under the topic "ICT 37 – 2015: Open Disruptive and Innovation Scheme" (ODI), which provides support to early stage high risk innovative SMEs in the ICT sector. We fit the challenge, scope and expected impact of the ODI topic because:

- We foster SmartRain, an innovative project which does have the potential to disrupt the current rain gauge market;
- The idea is innovative worldwide and is the invention of the founders of WaterView;
- We are the founders of WaterView: a young, innovative, high-risk/high-gain startup in the ICT sector;
- We are looking for swift support for validating, prototyping and demonstrating our idea.

Storia del progetto

1. Excellence

1.1 Objectives

The far-reaching objective of this project is to integrate traditional at-ground rain gauging systems with optical low-cost systems, with the ultimate aim of improving the spatial resolution of the current terrestrial rain-gauging networks and their capacity to map rainfall patterns at the ground.

Capturing rainstorm patterns in real-time with adequate spatial and temporal resolution is currently prevented by the sparseness of terrestrial rain-gauging networks and by the coarse resolution of both weather radar and satellite images. Damages caused by unobserved/improperly-managed rainstorms are huge. Insurance companies estimate yearly overall losses due to severe storms in Europe in about 5-8 billion EUR, while 400 billion US$ in damages are estimated annually in the US, based on US National Weather Service data [1]. Damages are expected to increase in the next decades, following the predicted increase in the frequency of heavy rainfall events at global scale [2]. Since the costs for repairing damages are estimated to be about 6 times higher than the cost of adaptation, the market for technologies to adapt to climate change is rapidly growing in Europe and worldwide.

Water for food production already accounts for about 70% of global freshwater withdrawals. Estimates show that 45% more agricultural water will be required by 2030 to feed 8 billion people [4]. Meeting the growing need for actionable hydrological information using increasingly sophisticated technologies does represent the main avenue toward a high return on investment in managing water resources to ensure collective water security.

Within this general context, our project investigates the technical and economic viability of a novel solution for monitoring rain at the ground. The system is designed for being composed by i) a hardware module for acquiring images during rain events and either processing or sending them to a cloud-based service; ii) a software module (i.e., the SmartRain algorithm) which stores and processes the registered images to derive quantitative rain rate measures. The SmartRain algorithm is patent pending since January 2015; an experimental proof a concept of the technology is presented by [3]. We are currently validating the technology in the lab and in the real environment (with low cost sensors under real rain conditions). Some technical detail about the overall idea, ground principles and technology are reported in Figure 1.3a.

The objectives of the feasibility study are listed herein, in a chronological order:

a. Prototyping the system as a stand-alone sensor;
b. Testing the system portability to non-dedicated cameras;
c. Exploring the market: volumes, geographical areas, trends, segments, barriers;
d. Identifying a cost-effective technological proposition for the market;
e. Defining the value proposition(s);
f. Demonstrating the system in the relevant environment;
g. Defining a go-to-market strategy.

1.2 Relation to the work programme

The project is framed under the topic "ICT 37 – 2015: Open Disruptive and Innovation Scheme" (ODI), which provides support to early stage high risk innovative SMEs in the ICT sector. We fit the challenge, scope and expected impact of the ODI topic because:

- We foster SmartRain, an innovative project which does have the potential to disrupt the current rain gauge market;
- The idea is innovative worldwide and is the invention of the founders of WaterView;
- We are the founders of WaterView: a young, innovative, high-risk/high-gain startup in the ICT sector;
- We are looking for swift support for validating, prototyping and demonstrating our idea.

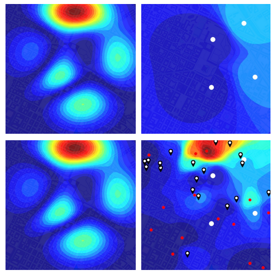
1. EXCELLENCE

1.1 Objectives

Our objective is to provide the public administration with a brand new, IoT based solution for abating the costs and improving the quality of real time rain mapping. The solution is built around our patented technology SmartRAIN and uses advanced image processing techniques to transform imaging devices, like surveillance IP cameras and smartphone cameras, into "eyes" for seeing, gauging and communicating rain intensity in real time. By augmenting the potential of non dedicated, existing hardware, we will integrate traditional rain gauging networks (which are sparse and expensive) with cheaper, denser and smarter networks of fixed and mobile sensors, thus disrupting the current panorama of data acquisition rainstorm sensing.

Our innovation will enable our customers (public bodies in charge of natural hazard management and civil protection duties, public entities that manage transport infrastructures, public agencies that manage rain gauging networks, managers of urban drainage systems) to release better weather-related services to citizens (our users) by:

- Publishing real-time open rain maps based on the fusion of traditional and SmartRAIN weather data on public web portals and a dedicated app;
- Engaging citizens in taking (and sharing) rain measures by shooting pictures during rainstorm events, through the same dedicated app;
- Issuing personalized alerts based on real-time rain data and citizens geo-localization.



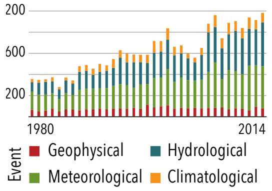
Comparison between a real rain event (left column) and its reconstruction based on the measures taken by few traditional rain gauges (top right) or in presence of additional fixed and mobile SmartRAIN nodes (bottom right).

Why

Losses due by unobserved/improperly-managed rainstorms are huge. Insurance companies estimate yearly overall losses due to severe storms in Europe in about 5-8 billion EUR, while 12,3 billion US$ in damages are estimated annually in the US, based on US National Weather Service data [1]. Damages are expected to increase in the next decades, following the predicted increase in the frequency of heavy rainfall events at global scale [2]. Since the costs for repairing damages are estimated to be about 6 times higher than the costs of adaptation, the market for technologies to adapt to climate change is rapidly growing in Europe and worldwide.

Today rainfall is monitored by combining the information from terrestrial rain gauging systems, weather radars and satellite images. Capturing rainstorm patterns in real-time with adequate spatial and temporal resolution however is yet to be satisfactory, due to the coarse resolution of both weather radar and satellite images and to the sparseness of terrestrial rain-gauging networks. Network sparseness is mainly ascribable to the relevant costs associated with the installation and maintenance of current instrumentation (2000 €/year for a standard tipping-bucket rain gauge with a 10 year-long service life, 300 k€/year for a weather radar with a 50 year-long service life).

Number of loss events worldwide 1980-2014



Source: NatCarSERVICE by Munich RE

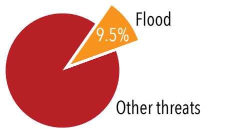
Bizopp in figures

The magnitude of the entire weather-related industry, both in the public and private sectors, is estimated at 30 G€, and data are the new oil for this industry. At the end of 2015 IBM acquired most of The Weather Company for over 2 G$. The dimension of the deal is mainly motivated by the nature of the core product of The Weather Company: weather data. IoT technologies allow to collect huge amounts of environmental data at a reasonable cost, anytime and anywhere. In our case, the number of IoT-ready, unconventional rain gauges like IP and smartphone cameras is already large, and is growing very fast.

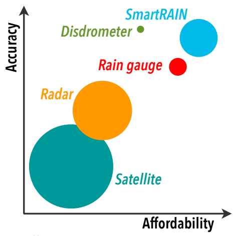
There are 1.5 billion smartphone users in the world. In other words, more people have mobile phones than have access to flush toilets and electricity. Smartphones outsold feature phones for the first time ever in the first quarter of 2013, with Asia as the fastest growing market with 74.1% growth [3].

The IP video surveillance camera market is expected to grow at a CAGR of 32.1% (2014–2020), with 90 million units sold in 2020. The increase in number of infrastructure projects and smart cities is resulting in a quick adoption of IP cameras, which are developed with ability to perform analytics not only at the server but also within the camera [4].WaterView will leverage the power of digital cameras in the world of IoT to turn, for the very first time, non-dedicated hardware into simple yet powerful tools for an effective rainstorm hazard management and mitigation.

Total GDP@Risk ($4.56trn) by threat



Source: Lloyd's City Risk Index 2015-2025



Affordability, Accuracy and Spatial coverage (proportional to diameter) of rain sensing technologies

Cosa abbiamo cambiato

- Partire da evaluation grid
- Curare la presentazione della domanda
- Trovare un partner – inserire lettera intenti
- Stabilire tempi e obiettivi chiari e verificabili

waterview

Cosa abbiamo cambiato

Description of work (broken down into tasks)

Business-oriented activities	*Verification (minimum thresholds)*
T A Seizing citizens' interest towards rain/flood hazard prevention	
T A1 Data mining of images and videos shared during hazardous events	1000 images mined on socials and analyzed
T A2 Primary researches on large citizen samples	1000 people contacted through online surveys
T A3 Pilot engagement experiments on selected user communities	4 engagement actions performed
T B Characterizing the customer landscape	
T B1 Contacting public bodies in charge of civil protection duties in EU	10 EU public bodies contacted
T B2 Categorizing administrative procedures	Report mapping authority and administrative structures
T B3 Measuring authority fragmentation and defining territorial competences	3 most achievable EU countries identified
T C Identifying and contacting potential European commercial partners	10 resellers contacted, at least 2 positive feedbacks
T D Performing a complete risk analysis	
T D1 Strategy definition in case of lack of funding	Internal report with company priorities in 5 years
T D2 Privacy restrictions on images acquired in urban environment	10 countries investigated, at least 3 positive feedbacks
T D3 Platform dependent hardware/software constraints	5 hardware producers contacted

waterview

Con WaterView nasce a Torino un nuovo sistema per «misurare» la pioggia

–di Francesco Antonioli | @FAntonioli | 21 settembre 2016

Il Sole 24 ORE
EconomyUp.it
StartupItalia!
la Repubblica
il Giornale del Piemonte
startupper
IM-Impresa Mia – Quotidiano della piccola e micro impresa
StartupItalia!
INGEGNERI.cc
RADIO 24
Be Beez
ENPLEINAIR NEWS
C INNOVAZIONE

waterview