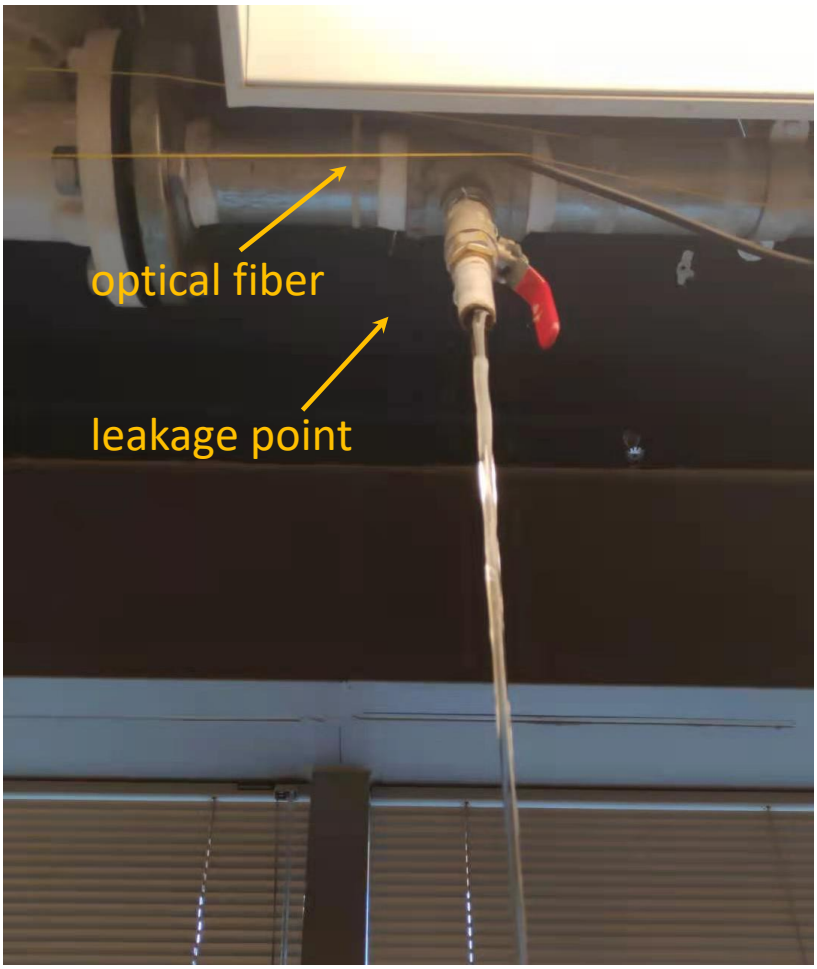
News Article for RISUD Strategic Focus Area (SFA) Scheme

		Name	Department
1.	**Principal Investigator**:	Prof. Xiaoli DING	LSGI/PolyU
2.	**Name of SFA:**	Smart Utilities	
3.	**Project Title:**	Development of a Strategic Focus Area (SFA) in Utility System Research	

4. **Third Year Progress/Achievement**

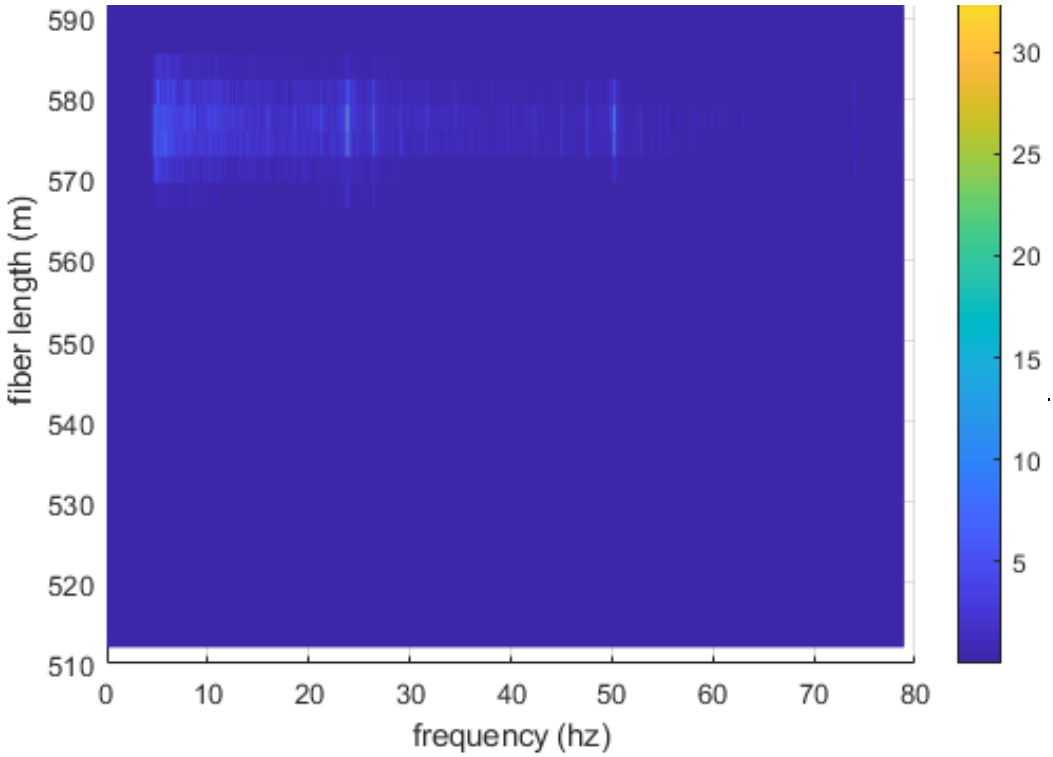
The project during the reporting period has focused on developing and testing various sensing technologies to detect and monitor conditions of underground utilities systems. The technologies include space borne radar remote sensing technologies, satellite based positioning technologies, in-situ sensors such as fiber optic sensors, and ground based radar technologies such as ground penetrating radars (GPR). For example, a series of experimental studies have been carried out in both laboratories and real site environments to study how fiber optic sensors can be optimally used to detect water leakage accurately, a remaining technical challenge in water pipe management. Figure 1 shows the experimental setup of a fiber optic sensor system in a laboratory environment while Figure 2 illustrates the process of system installation of such a sensor at a real site. Figure 3 is an example of the water leakage signals detected by the fiber optic sensor system.

The research has enabled better understanding, and enhanced the performance of the technologies in monitoring conditions of underground utility systems. For example, new interferometric synthetic aperture radar (InSAR) algorithms have been developed to enhance the capability of the technology for more accurate monitoring of ground and infrastructure deformation. Time-lapse GPR slices and change detection algorithms have been developed for more accurate subsurface diagnosis. Better understanding of fibre optic sensor technologies in monitoring water pipe conditions have been achieved through various site and laboratory experiments.



A fiber optic sensor system is used in a laboratory to detect signals of water pipe leakage

A fiber optic sensor system is being installed at a site



Water leakage signals detected by a fiber optic sensor system