

The background image shows a narrow cobblestone street in a European city, likely in the Netherlands. On the left is a dark building with white-framed windows and a central arched doorway. On the right is a canal with a metal railing, and several bicycles are parked along the street. The scene is captured in a slightly desaturated, artistic style.

德国凯芬洛雨洪培训中心

SCHULUNGSZENTRUM REGENWASSERNUTZUNG KEFENROD

中国区主任 曾誉录

Y.T. Tzeng, Director, China District

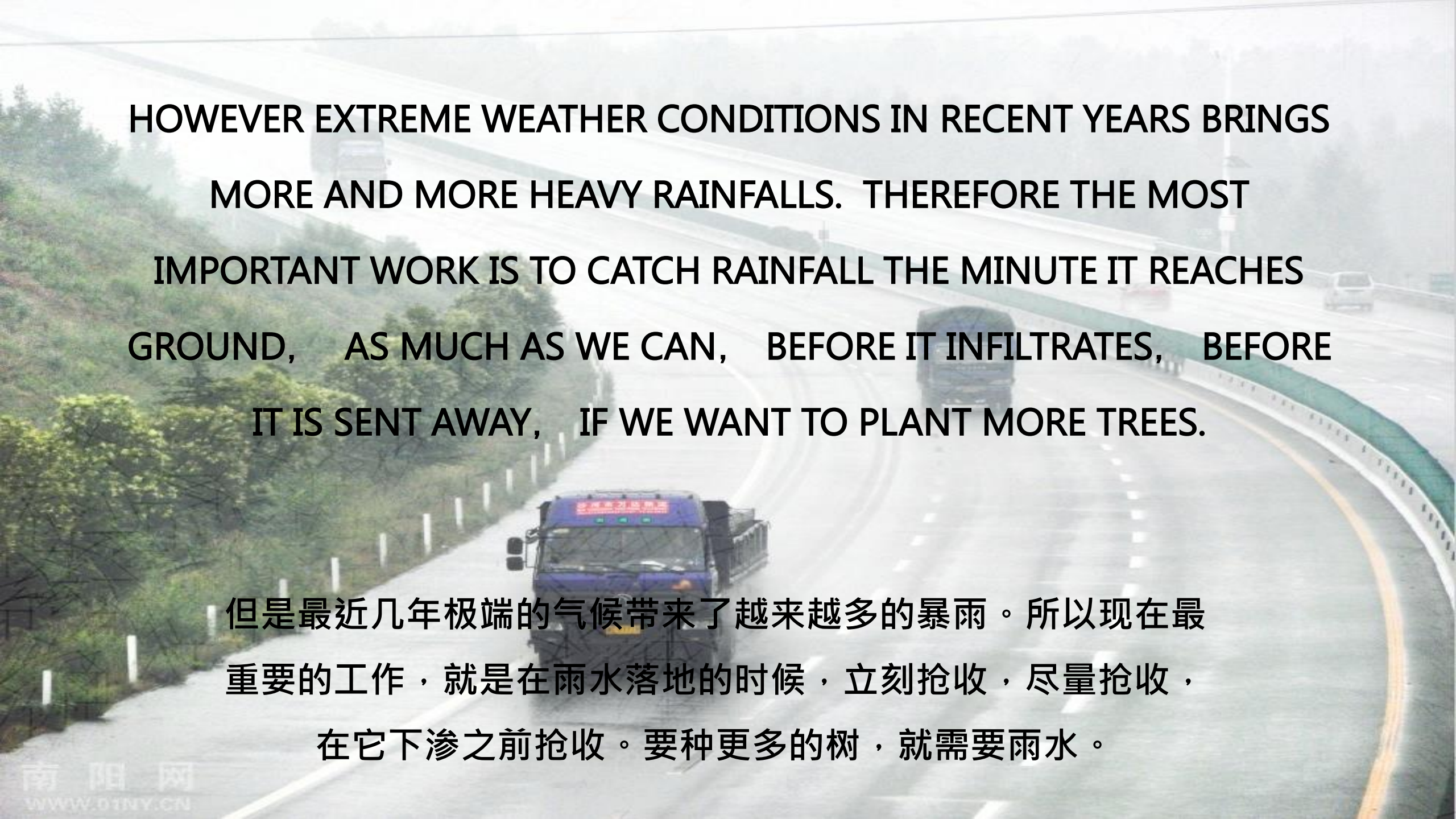
ONE DIRECT AND EASY WAY TO REDUCE, CO₂ ON EARTH, IS TO PLANT MORE TREES. VAST AREAS OF LAND IN, HINA DOES NOT HAVE VEGETATION DUE TO LACK OF WATER, NOT BECAUSE OF SHORTAGE OF RAINFALL, BUT BECAUSE THE LAND WILL NOT HOLD THE RAINWATER AT ALL. THE EARTH CONTAINS ONLY SAND, WHICH ALLOWS RAINWATER TO INFILTRATE AND DISAPPEAR IMMEDIATELY.

减少地球上的二氧化碳最简单的方法之一是种更多的树。中国有大片的土地，没有植被，因为缺水，但不是因为缺少下雨，而是因为这里土地完全留不住雨水，土地都是沙质的，雨水很快就渗入，不见了。



**IN CITIES, FOR MORE THAN 50
YEARS, ENGINEERS TRIED VERY
HARD TO DRAIN RAINWATER
QUICKLY FROM STREETS, INTO
WASTEWATER PLANTS OR RIVERS.**

过去五十年，我们设计院主要的任务是把雨水快速的从街上排掉，排到废水处理厂或者河流。

A photograph of a multi-lane highway during a heavy rain or fog. A blue truck is driving away from the camera in the foreground. Other vehicles are visible further down the road. The text is overlaid on the image.

HOWEVER EXTREME WEATHER CONDITIONS IN RECENT YEARS BRINGS
MORE AND MORE HEAVY RAINFALLS. THEREFORE THE MOST
IMPORTANT WORK IS TO CATCH RAINFALL THE MINUTE IT REACHES
GROUND, AS MUCH AS WE CAN, BEFORE IT INFILTRATES, BEFORE
IT IS SENT AWAY, IF WE WANT TO PLANT MORE TREES.

但是最近几年极端的气候带来了越来越多的暴雨。所以现在最
重要的工作，就是在雨水落地的时候，立刻抢收，尽量抢收，
在它下渗之前抢收。要种更多的树，就需要雨水。

CHINA HAS 5 MILLION KM OF HIGHWAYS AND FREEWAYS,
AND THE MILEAGE GROWS EVERYDAY. THE SLOPE
AUTOMATICALLY DRAINS RAINWATER TO ROADSIDE DITCHES.
ALL WE HAVE TO DO IS TO CATCH RAINWATER IN THE DITCHES.



中国有五百万公里的省级公路和高速公路，这个里程数每天都在增加。公路的倾斜坡度自然就把雨水排到马路边的水沟里面。我们只需要在水沟里面抢收雨水就可以。

机动车道

非机动车道 人行道

LATEST RAINWATER HARVESTING TECHNOLOGIES PERMIT UNDERGROUND CATCHMENT WITH AUTOMATIC FILTRATION OF RAINWATER, TO A CONDITION SUITABLE FOR STORAGE FOR A LONG TIME, WITH NO NEED FOR HUMAN CARE, NO LABOR NEEDED, NO ELECTRIC POWER NEEDED. IT ALL HAPPENS NATURALLY. THE SYSTEMS ARE SELF-CLEANING. AFTER EVERY HEAVY RAINFALL, OR ONCE A YEAR, A CHECKUP MAY BE NEEDED.

雨水回收的最新科技可以让雨水自动过滤进入地下储存空间。达到适合储存的水质标准，可以储存很久，不需要人工照顾，不需要人力处理，不需要用电。整个过程自然发生。整个系统自动保持清洁。每次下大雨以后或者每年检查一次就可以。

街边回收雨水蓄水净化系统



WITH A LITTLE MINIMUM ELECTRIC POWER INPUT, THE TECHNOLOGIES PERMIT INTELLIGENT MANAGEMENT OF RAINWATER. THANKS TO THE INTERNET AND CLOUD STORAGE CALCULATION, YOU CAN CHECK SYSTEM EFFICIENCIES ON YOUR MOBILE, TO HELP GOVERNMENTS ORGANIZE THEIR SPONGE CITY EFFORTS, SUCH AS FLOOD PREVENTION, DISASTER FORECAST, VILLAGE EVACUATION OR POLLUTION CONTROL.

如果稍微用一点电力，雨水回收科技可以做到智能管理雨水。由于有互联网和云端储存计算，你可以在手机上随时检查系统的效率与工作情况，可以帮助各地政府组织他们的海绵城市工作，譬如洪水预防、灾难预测、村庄迁移、或者污染控制。



MOST IMPORTANT OF ALL, RAINWATER MANAGEMENT HELPS BUILDING OUR CITIES OF TOMORROW, THE VIRTUALLY MOST RESILIENT CITIES, BECAUSE HEAVY RAINFALLS ARE NO LONGER DISASTERS, BUT ARE TAMED FOR USE. RAINWATER HARVESTING HELPS TO CREATE MORE REASONABLE/RATIONAL DISTRIBUTION OF HUMAN SETTLEMENTS TO MUCH WIDER AREAS IN CHINA. OLD CITIES THEN CAN CATCH THEIR BREATH TO REBUILD STREETS AND COMMUNITIES TO ACHIEVE LOW CARBON TARGETS.

最重要的是，雨水的管理，帮助我们创造明天的城市，是实际上最有弹性的城市。因为暴雨不再成为灾难，被我们人类驯服了使用。雨水回收可以帮助政府调整人口的分布，到国内更宽广的区域。这样子老旧的城市就可以喘一口气，重新调整街道和社区，达成低碳的目标。

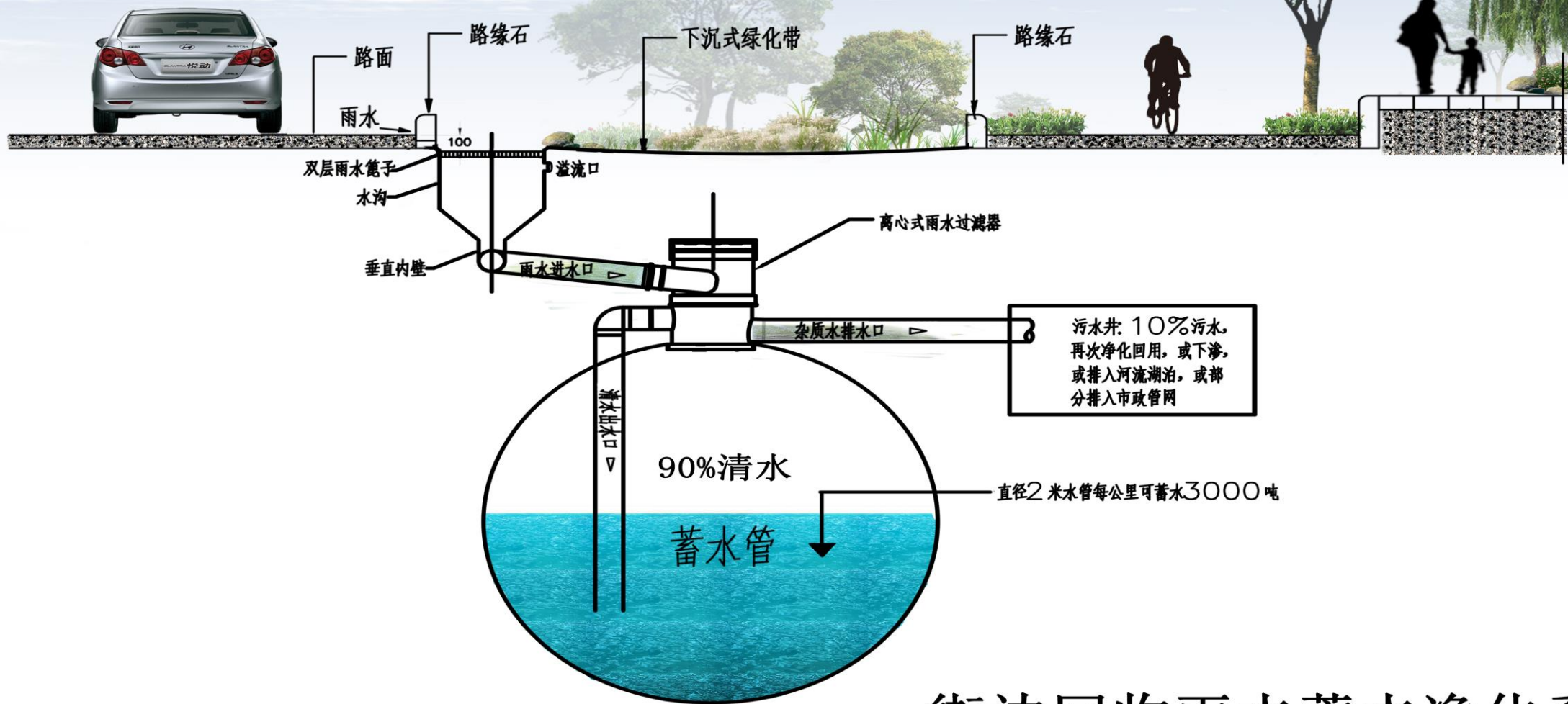
机动车道



非机动车道



人行道



街边回收雨水蓄水净化系统

STORAGE OF RAINWATER IS AN IMPORTANT PART OF RAINWATER HARVESTING

TECHNOLOGIES. RAINWATER DRAINING PIPES AS BIG AS 1-2 METERS DIAMETER ARE

EXCELLENT CHOICES FOR STORAGE WHEN YOU SEAL BOTH ENDS TO CREATE A

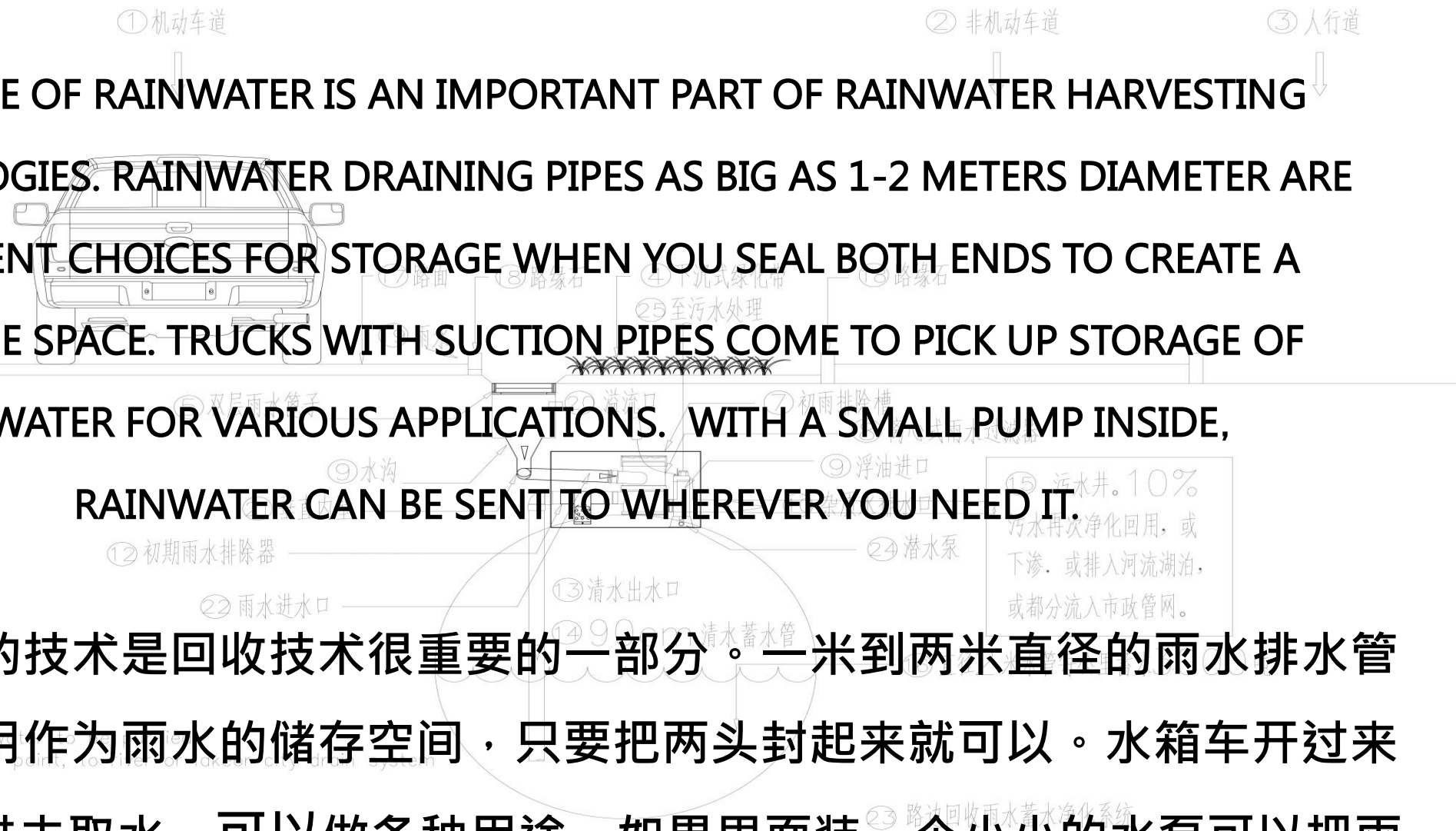
STORAGE SPACE. TRUCKS WITH SUCTION PIPES COME TO PICK UP STORAGE OF

RAINWATER FOR VARIOUS APPLICATIONS. WITH A SMALL PUMP INSIDE,

RAINWATER CAN BE SENT TO WHEREVER YOU NEED IT.

雨水储存的技术是回收技术很重要的一部分。一米到两米直径的雨水排水管最适合选用作作为雨水的储存空间，只要把两头封起来就可以。水箱车开过来把管子伸进去取水，可以做各种用途，如果里面装一个小小的水泵可以把雨水送到你需要的地方。

- 1.motorway
- 2.bicycle way
- 3.pedestrian way
- 4.lowered grassland
- 5.double-layer ditch screen
- 6.ditch
- 7.first flush remover tank
- 8.vortex filter
- 9.grease/oil exit
- 10.dirty rainwater
- 11.exit to
- 12.first flush remover tank
- 13.clean water pipe
- 14.90cm dia pipe storage tank
- 15.Wastewater
- 16.for re-use, to the first flush point, to the first flush point, to the first flush point
- 17.pavement
- 18.Curbs
- 19.rainwater
- 20.Overflow
- 21.Vertical inner wall
- 22.Rainwater inlet
- 23.Roadside recycling rainwater storage purification system
- 24.Submersible pump
- 25.To sewage treatment



EXAMPLE: 1.6M DIAMETER PIPES BURIED 2 METERS UNDERGROUND ON ROADSIDE COSTS ROUGHLY 317,500RMB TO BUILD, HOLDS 2,000 CUBIC METERS OF WATER, SO WE SPEND 158.75RMB PER CBM, AND IT LAST FOR MANY YEARS. EACH KM OF FREEWAY COSTS ROUGHLY 50 MILLION RMB TO BUILD, WHILE EACH KM OF 1.6M PIPES COSTS 317,500RMB, REPRESENTING 0.635%, OR LESS THAN 1% OF TOTAL CONSTRUCTION COSTS. THE INVESTMENT IS VERY SMALL.

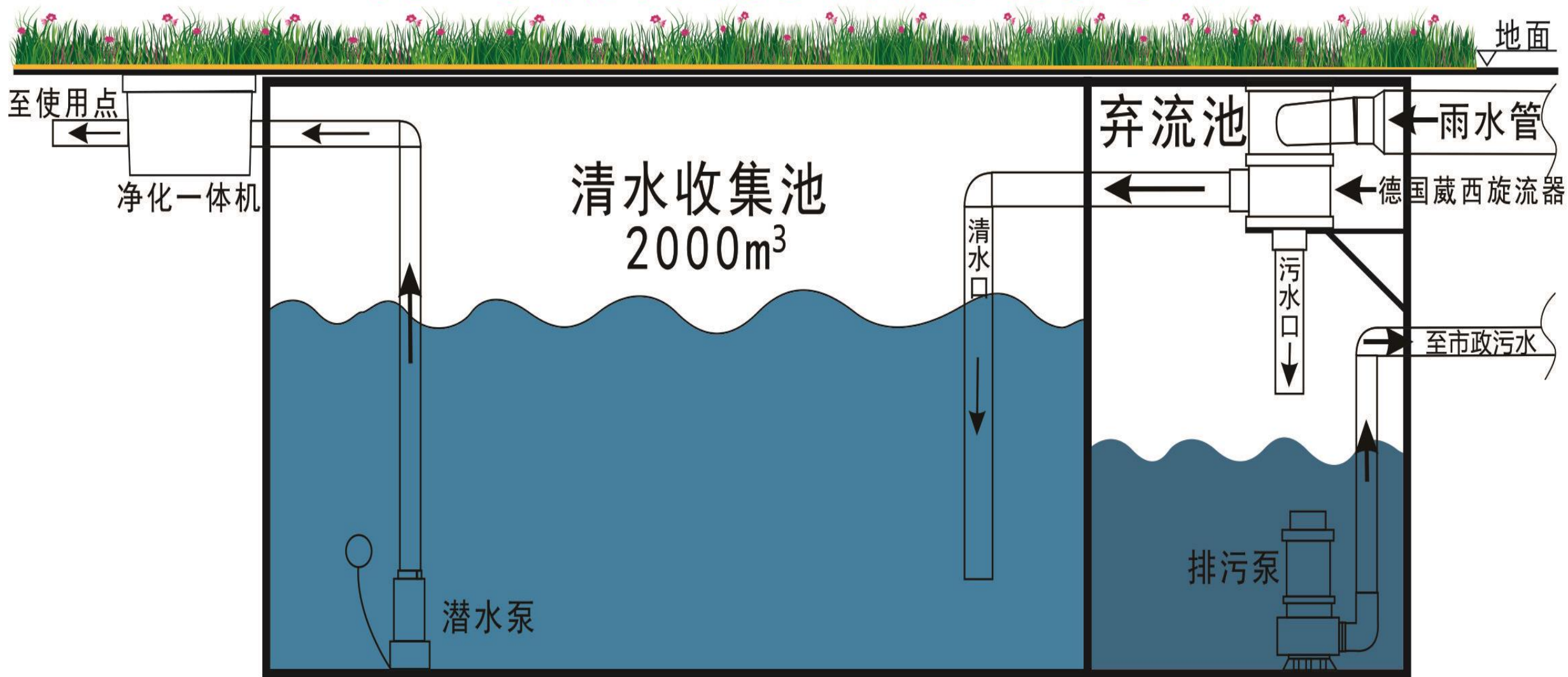
举一个例子。1.6米直径的管子埋深2米，在马路的一侧施工的成本，大约是317500元人民币，可以储存2000立方雨水。每立方成本158.75元，可以用很多年。每公里的高速公路的建造成本超过五千万人民币。相对来说317,500人民币只合公路建造成本的0.635%也就是不到百分之一，这个投资是非常小的。



GERMAN FAMILIES CAN REPLACE AVERAGE 50% OF THEIR CITY WATER SUPPLY WITH RAINWATER, BECAUSE THE WATER BILL MORE THAN DOUBLES IF YOU DO NOT HAVE A RAINWATER HARVESTING SYSTEM IN YOUR HOUSE. AT THE SAME TIME, STATISTICS IN USA SHOWS TOTAL POWER CONSUMPTION OF CITY WATER SUPPLY REPRESENTS 13% OF THE NATIONAL POWER CONSUMPTION.

一个德国的普通家庭可以用雨水来取代50%以上自来水。因为如果你不不使用雨水回收系统，你的水费可能会增加不止一倍。美国的统计数字显示，整个自来水供应系统耗电量占全国耗电量的13%。

已完工水箱安装雨水回收系统示意图

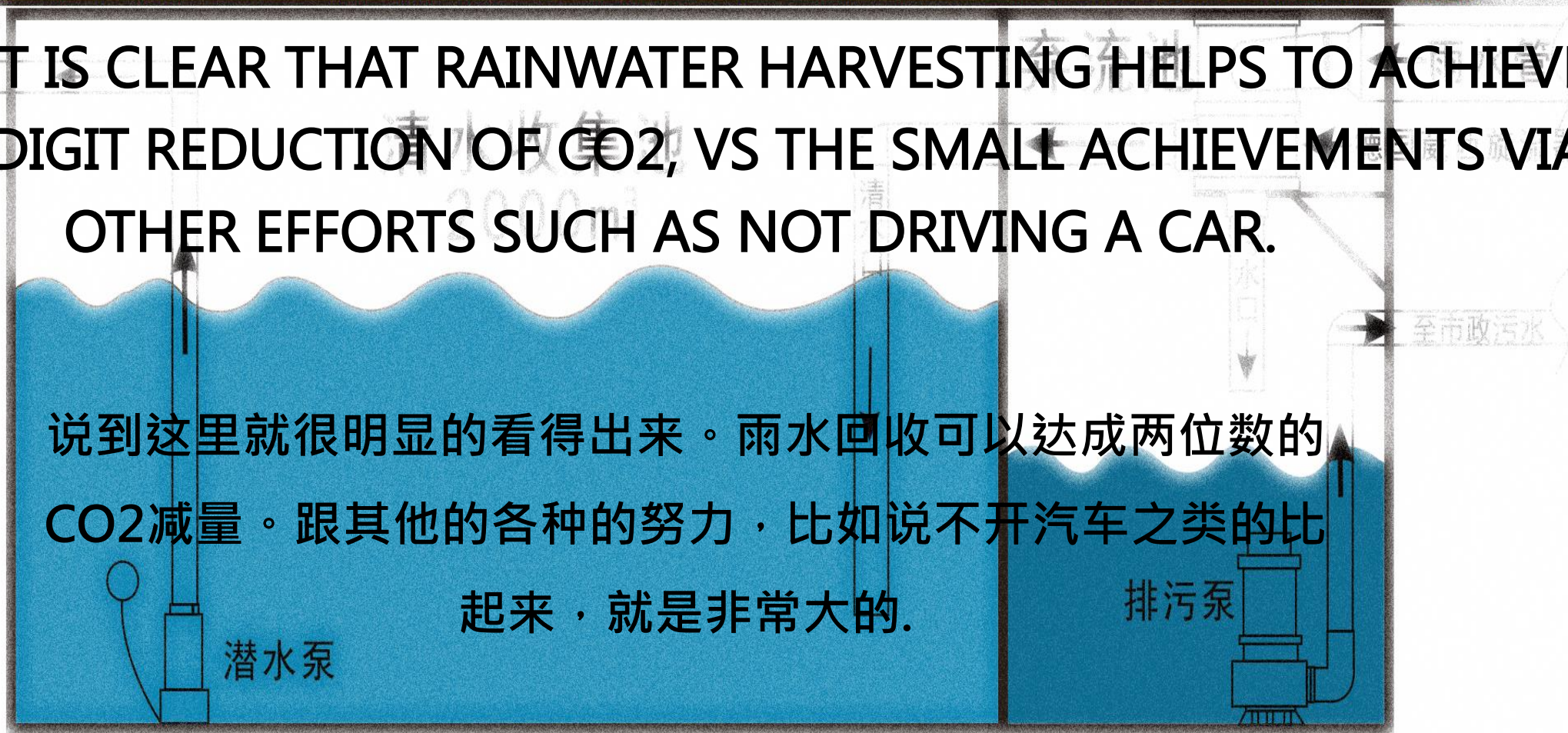


1. 本系统造价为市场最低价
2. 后续费用几乎是0

已完工水箱安装雨水回收系统示意图

BY NOW IT IS CLEAR THAT RAINWATER HARVESTING HELPS TO ACHIEVE DOUBLE-DIGIT REDUCTION OF CO₂, VS THE SMALL ACHIEVEMENTS VIA OTHER EFFORTS SUCH AS NOT DRIVING A CAR.

说到这里就很明显的看得出来。雨水回收可以达成两位数的CO₂减量。跟其他的各种的努力，比如说不开汽车之类的比起来，就是非常大的。



1. 本系统造价为市场最低价
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A photograph of a dense forest with tall, slender trees. Sunlight filters through the canopy, creating a dappled light effect on the forest floor. The trees are mostly deciduous with green leaves, and some evergreens are visible in the background. The ground is covered with fallen leaves and small plants.

**PLANTING MORE TREES BY COLLECTING RAINWATER IS
ONE GREAT WAY TO TAP THE TREMENDOUS RESOURCE
OF NATURE---MUCH BIGGER THAN OTHER HUMAN
EFFORTS.**

收集雨水来帮助种更多的树,是利用大自然非常巨大天然资源的方法。这个比人类的渺小的各种努力,要大很多倍.

IN CHINA, ALL THESE WILL BE DONE BY THE GOVERNMENT. ARCHITECTS CAN BE EASILY PERSUADED BY PRIVATE INSTITUTIONS SUCH AS ADB, INTO ADOPTING NEW STRATEGIES AND TECHNOLOGIES, BECAUSE THEY ARE LOOKING FOR WAYS TO ACHIEVE SPONGE CITY TARGETS AND OFTEN FAIL. SEMINARS SPONSORED BY PRIVATE INSTITUTIONS WILL BE ONE VERY COST-EFFECTIVE WAY TO BRING ABOUT THE CHANGES. THESE HAS BEEN GOING ON FOR A WHILE NOW, BUT FAR FROM ENOUGH, FAR FROM WIDESPREAD.

- 中国这些工作都是政府在做。私企（譬如ADB）提供的建议与新策略，设计院很容易就会接受，因为他们找寻达成海绵城市目标的方法都不成功。私人单位举办各种研讨会，是一个很有效的的方法，可以带来改变。这些活动进行已经有一阵子了。但是还是远远的不够，远远的没有达到普及的程度。

**THE NICE PART OF THE JOB IS YOU ONLY NEED TO
INFLUENCE THE TOP GOVERNMENT OFFICES AND TOP
ARCHITECTURE OFFICES, ALL OTHER ARCHITECTS AND
LOWER GOVERNMENTS WILL FOLLOW.**

- 这样的做法好处就是你只需要影响上层政府单位，上层设计院，其他的设计院和下级政府都会遵从。