

Karl Fjellstrom Vice Director, ITDP UNCRD EST Conference 24 August 2010, Bangkok



High capacity BRT planning, implementation & operation: Case study of the Guangzhou BRT







Steps in the Guangzhou BRT planning process

2003-2004 preliminary BRT planning
ITDP MOU with Construction Commission of Guangzhou , Apr. 2005
GMTDC / GMEDRI work with ITDP since that time

> 2005: Conceptual plan, demand analysis & corridor comparison

2006: Phase II planning; further traffic, operational and design planning & demand analysis for phase I 2007-2008: Implementation planning & design. Final station & operational design, BRT authority, architecture, engineering design, metro integration, NMT integration 2009:

BRT construction, regulatory set-up, refinement of operational plan, promotion & outreach, vehicle procurement

2010:Feb. BRT operation





Guangzhou BRT by the numbers

Some key points include:

- Peak passenger flows of 26,900 passengers per hour
 per direction. This is second only to TransMilenio
 amongst BRT systems worldwide, and far in excess of
 traditional capacity limits thought to apply to direct
 service' BRT systems in which BRT vehicles operate
 both inside and outside the BRT infrastructure. The
 Guangzhou BRT already carries more passengers in a
 single direction than all of the metro/subway lines in
 mainland China, with the exception of the Beijing Line 2
 subway. With the introduction of 18m BRT buses, the
 system will likely exceed all mainland China metro
 systems within a year
- Daily ridership of around **800,000 passenger-trips per day on BRT buses** (not including trips involving transfers, which are free in the same direction). This is more than any of Guangzhou's 5 metro lines.
- Passenger boardings of **8,500 passengers per hour** (not incl. transfers) at the biggest morning and evening peak stations; world records for any BRT station.
- Passenger boardings of more than **55,000 passengers per day** at a single station (not including transfers), also a world record.

- The world's **longest BRT stations** around 260m including bridges, at the largest stations.
- The world's **highest BRT bus volumes**: 350 per hour in a single direction, or roughly 1 bus every 10 seconds
- The first BRT system in China to include **bike parking** and **bike sharing** in the BRT station design.
- The first BRT system in the world to include **direct connecting tunnels between metro and BRT stations**. These connections occur at 3 stations (one open; two more still under construction).
- The first BRT system in China to feature **BRT station bridges connecting directly to adjacent buildings**. These various inter-modal connections (BRT, metro, bike sharing, bike parking, pedestrians, adjacent buildings) make the corridor a leading example of multi-modal transport integration.
- The first BRT system in China with **more than one BRT operator**: three corporate groups consisting of seven different bus operating companies all operate BRT routes.
- The first BRT system in Asia to determine **station size based on passenger demand**, for all stations in the BRT system. This results in a range of station lengths from 55m to 260m.



Asian BRT systems speed and demand comparison. Note that these figures refer to actual maximum passenger demand, not theoretical maximum capacity. All figures are from ITDP field surveys.







市长报告勾勒广州九大民生领域政府工作重点 鼓励步行 11111日天经也是步行交通实现人车分离的一种方式 住房地铁沿线 教育 高中招生改革缓解择校问题 交通 在万庆良看来,广州的教育事 事)招生;将部分普通高中优质学 建保障房 鼓励更多居民 业发展虽然已取得明显成效,但教 位按照初中学生人数比例直接刘扬 ACTE 96 96 98 70 182 , 75 18 88 38 育均量化问题还没有很好解决。 哲学校,由学校初中即根据公司 ,和束将加强保障性性的保险, 采用步行交通 大任房庭牌覆盖面,园时,运转 务教育均衡发展。"万庆良强调,要 学生并人国来联示范性普通高中, 坚持深化教育改革,重点推进普通 同时,让全市人民共享优质普通高 多生晶化室体神经作为建设用地 来想。包括结合"三田改造"和 策,在所存置固有建设用地用于 即增性自动错误。为在"田政 古"中起遗常分保障者化则(分离 高中招生制度改革,市财政全知拔 中教育资源,通过改革缓解初中的 在"初東解決交通期 步行设施系统的规划,提 堵问题"上,记者发现,鼓 防步行交通这种新龄提 的连续性相安全性,装饰 法第一次提出。万庆良相 更多层误采用步行交通。 利用历史遗活用地建设保障性信辱;从市铁局疾用地中规划出一 医疗 打造 15 分钟社区卫生服务圈 交通管理方面。万块 卫生服务圈,力争今年内完成128所 自提出,要促进交通波在 **立比例的居住用她用于保障性信** 50年不常日,100年加近 保险市损扶养,基本所存保国制度定 计区书中局条中心和190个社区目6 FT 18 19 ..

城事焦点

OCUS

服务站的设置和建设,形成"大病在医 院,小雨在社区,双向转诊,分级医疗 立医疗机构的公益性,落实公立原则 的格局,且2011年要完成全部县级资 政府补助改强。同时,要加强城市社区 原标准化建设,基本完成建卫生原和 卫生服务网络建设,打造15分钟社区 村卫生站标准化建设。

发展劳动密集型产业,大力支持中 右,且每年有数十万外来务工人员 小企业和民营经济的发展。同时, 以及大学毕业生前来寻找就业机 今年将投入5.8亿元,加大对就业 会,劳动力供大于求的矛盾日益尖 困难人员和"零就业家庭"的就业

社保 2014年实现养老保险全覆盖

扩大覆盖、提高保障。是今后广 州兆菁社会保障体系的方向。万庆良 表示,要以农村居民、个体工商户和 养老保险传递,缩小制度间、地区间。 城镇灵活就业人员为重点,扩大养老 保险覆盖面,到2011年35周岁以上 的发村居民基本参加系老保险,2017 本形成城乡统筹、标准规范的养老保 治安刑事案件高发

事案得高发状况仍未根本植物。 刑除了暫在今年确保互助会幣对 安全外,送時在今日通过加強用面 智力配置和社区营务建设,以加大 1会应安防控力度。今后将重点 抓好社会矛盾化解工作。从黑头上 何防和城少矛盾和府、许建立腰企 多元化的矛盾目的化解机制,推动 领导于影响访、下访、包索制度化 相常态化,初至增强化偏矛盾构积 的能力。

还未根本扭转

其對治安回顧,刀法自識,用

2008AAAAA AMA AMA A05

文化 城区每千户居民 有一个休闲广场

打造"文化厂则", 应是广州 建设国家中石城市的一大重市 工作,万俟县表示,站高标准理 Q公共文化服务体系,加大文化 场建设力度,实现辅放器防制 千户拥有一个标准的文化错过 健身休闲户外语动广场。而时 还将推进公共赚物牌、肥之馆。 天木馆,图节围,文化馆,体育场 前等公共文化设施关置开放成 传真开坡。

记失业人员年均保持在25万人左

锐。对此,要在调结构,促转变中 援助。

环境 加强公众监督提高城市文明 在人居环境问题上,万庆良表 "城市三分在睦,七分在管。"万 示,将大力实施旧城区成片改造,用 庆良强调,要深化城市管理体制改

三至五年时间,把列入重点改通的 革,逐步建立分工明确、责任到位 旧城区打造成最广州岭南文化特色 监督有力,或转高效,科学规范的城 和时代气息于一体的精品区域、同一市管理长效机制。坚持群众参与、加 时通过10年内完成138个"城中 强公众监督,实行人民城市人民管, 不断提高城市文明程度。

另一方面,万庆良透露,将逐步 提高城镇企业退休人员和农村居民 人群间的作老金差距。推进城乡居民 养老保险金制度并轨,到2014年基 险体系,实现全市居民全覆盖。

就业 今年5.8亿援助困难人员就业 万庆良说,目前,广州城镇登 扩大就业,大力发展服务业,合理

还要照应结束结果 把你分离上别切存,但6 民以沙行交通兼做健 路口通行方案,遵免产 身和支持环保出行方式 过多的趋行交感量和人

的問题,加强和完善全市 为的车辆堵塞。 7 延伸阅读

广州步行连廊拟人车分离 新快报讯 拟记者了 府巴确定选取珠江新城 解;广州市的步行交通规 核心区及兴盛路、火车东

刘建设北实也正在推进 站周边地区等区域作为 b. 其中,首批市中心区 首批步行连窗系统错误 步行亦愈系统已在春节 后开始建设;拟逐步打造 体现在把行人与机动车 具有国际水平的立体步 分隔在不同平面高度废 动,杜绝人车争道影响通





口行人过街的巨易和时间要赶,以减少行人过剩

的危险。在纽约,改进后的交叉口行人过街设计能

够成少36%的事故。



Shidajida BRT station; the world's longest



Bus stop congestion



A typical scene at Gangding BRT station before the BRT implementation.



Gangding BRT station, after the BRT implementation







Tianhe Gongyuan, west to east AM: 350 buses/hr; 25,000 passengers; 3,500 boarding / hour





Projected BRT passenger flows, comparing 3 corridors (ITDP & GMEDRI, 2006)













Impact on Station Saturation











BRT Station layout

BRT专用道



One of the 1-module configurations (offset, at grade)

One of the 1-module configurations (offset, footbridge)

职责

One of the 2-module configurations (facing, at grade crossing)

BRT专用道

改造现状天桥

BRT专用道

道和非机动车道

机动车道

中山大道

n ar 1-























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Chinese Cities Find Bus-Only Lanes an Alternative to Cars and Subways

By SAQIB RAHIM of ClimateWire Published: July 16, 2010

As the world hurtles toward 2 billion cars, an increasingly important issue for the climate will be this: How will China's citizens get to work?

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Entrepreneur's Life in China

With their rising incomes and access to freshly paved roads, many will be tempted to emulate Americans and buy cars. Some will ride the gleaming rail networks funded by Beijing. But in the past two years, China has also become the world's fastestgrowing market for high-speed city buses.

More

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NOW PLAYING

In February, the southern city of Guangzhou rolled out China's latest effort, a 14-mile stretch of a main road striped with bus-only lanes down the middle. The sleek buses race between raised stations that resemble train stops. Ridership has already shattered the figures of other bus systems in Asia. Now the system beats out the ridership of every metro line in mainland China except Beijing's.

Green Inc.

The approach is called bus rapid transit, or



















Gangding: 8500 passengers per hour entering turnstiles



Tangxia: 350 buses/h (2010.03.29, AM, E-W) (26,900 pphpd), 8,500 boardings per hour



























Guangzhou BRT integrated with Metro





BRT control centre







BRT-NMT integration

- Earlier work on designs at particular intersections and locations
- First dedicated bike lanes in a new road project in Guangzhou for more than 15 years.
- Provision of regular, safe crossings along the corridor for bikes and pedestrians, tied to the BRT station access
- Provision of 5,500 bike parking positions as part of the BRT station design, and first city outside Beijing to use multilayer bike parking racks
- Implementation of a bike sharing program concentrated initially along the BRT corridor (currently ~5,000 bikes at ~100 stations)

广州BRT将成为世界级的公共空间地标

在每一个BRT站应具备有完善的城市衔接,这个衔接为行人、自行车到达毗邻地方提供一个具有宜人的,有导向性的和让人感到安全和便利的环境。

设计的绿化空间应该是吸引人的和具有多样性的公园,同时要创造能方便到达城市各个地方 的链接网络。

BRT可视为城市长远发展投资的系统,它为市民提供一个以人为本的可持续发展的环境.

Around 40 location have installed double tier bike racks

Phase 1 bike sharing station locations and the newspaper report

Current bike parking suggests bike parking facilities we need to provide along BRT corridor

Operational mode (trunk-branch vs. 'flexible' or 'directservice')

Route 289, east to west, morning peak boarding and alighting passengers per hour (left axis) and occupancy (right axis).

31 BRT Route, and express lines during peak hours, short lines; 'Direct service' BRT system, BRT bus can run outside the corridor;

Morning peak passenger flows

Morning peak passenger flows (E-W & W-E) along the candidate BRT corridors

BRT Players and Organization Framework

With more than One Operator

Lessons learned (1)

- Guangzhou BRT: metro-level capacity delivered by buses. This provides new options for rapidly growing Asian cities.
- Many critical aspects to BRT project success:
 - corridor selection,
 - data collection & analysis,
 - operational design,
 - institutions & regulation,
 - communications and outreach
 - control centre & ITS

- stations (placement relative to intersections, configuration, length, width, spacing, and architecture),
- fare collection,
- vehicles, traffic engineering & management,
- intersection design & signal phases,
- modal integration (metro, bicycle, pedestrians),
- ancillary measures such as parking & urban design.

Lessons learned (2)

- The first BRT corridor should serve high demand, congested locations, including the city centre.
- the infrastructure has to be correctly planned and designed together with an operational plan that in turn meets passenger demand
- BRT stations should be designed to meet passenger demand levels

- There are many advantages to having multiple BRT operators
- Intermodal integration is often neglected during BRT planning, to the detriment of the BRT systems involved
- A successful BRT corridor should be a beautiful urban corridor

Information, maps, photos: chinaBRT.org, itdp-china.org, chinabikesharing.org