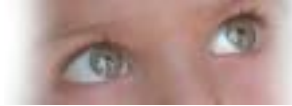




**Earthquake Reconstruction  
& Rehabilitation Authority**



**Rebuild, Revive  
with  
Dignity & Hope**



## **Fountains of Life: Rebuilding Water and Sanitation Systems in Earthquake-affected Areas in Pakistan**





# PREFACE

The mammoth task carried out by the Earthquake Reconstruction and Rehabilitation Authority (ERRA) has a human face, too, which is being brought out in the case studies on selected themes from reconstruction programme sectors. The story of the process of the water and sanitation programme of ERRA is one of the series. Other programme sectors include Rural Housing, Education, Health, Urban Housing, Town Planning, Livelihood, Social Protection, Environment, Road/Transport, Telecommunication, Power and Government Buildings.

ERRA's mandate includes restoration and reconstruction of physical assets and infrastructure as well as revival of livelihoods that were lost in the massive earthquake of October 8, 2005. The coverage extends to 3.5 million affected population in nine districts of AJK and NWFP spread over an area of 30,000 sq. km. that consists of difficult mountainous terrain, remote and dispersed settlements and a population unaware of the hazards of natural disasters of this scale.

The reconstruction programme that took off in April 2006 is now gaining momentum. A large number of private housing units are being built on seismically resistant designs. All Education and Health facilities have been made functional, some in newly constructed buildings and others in interim structures. Water facilities have been provided at the doorstep or in community dwellings while mechanism for testing of water quality and filtering system has been established; in some areas for the first time in the history. Sanitation infrastructure at community level has been restored and attitude towards personal and external hygiene has been built through awareness raising. As livelihoods of people are being revived, measures for protection of environment have also been introduced. Skills' training has been provided to both men and women and as a result a large pool of skilled/semi-skilled workers has been developed. Community participation was ensured in the process to create a sense of ownership.

ERRA takes pride in being able to catalyse the process of social change in communities through programme interventions that are pragmatic and people focussed. Over the last one and a half years, while striving to convert this adversity into an opportunity, ERRA established close affiliations with communities it stands to serve. The period is marked with mutual learning and sharing of success and failures with stakeholders.

While this process will go on for a few more years, it is important to create milestones from time to time to keep the spirit of work and sense of achievement alive. The brief snippets captured in these case studies are a harbinger of a bigger social change in the offing.

It is also an occasion for ERRA to reiterate its commitment to the earthquake-affected people to deliver the reconstruction and rehabilitation programme with full dedication. It is not an end in itself, but a means to achieve a better quality of life across board.

Altaf M. Saleem  
Chairman



The earthquake of October 8, 2005, was unprecedented. Never since its foundation has the country been confronted with a disaster of such a magnitude – 73,338 people were killed; 128,304 were injured; and 3.5 million were displaced. The earthquake also took a heavy toll on water supply and sanitation systems. Intake structures, treatment plants, storage reservoirs, supply mains and distribution networks were damaged or destroyed. Household toilets, sewerage networks, drains, solid waste management-related equipment and infrastructure, as well as offices and residential buildings of the line departments, also suffered considerable damage. In monetary terms, the losses to WatSan (water supply and sanitation) facilities were calculated at PKR 3.6 billion (US\$61 million)<sup>1</sup>.

The tectonic movement also resulted in disturbance of sub-surface aquifers and their outlets in the form of springs. The yield of wells and springs dropped significantly while water sources in many localities dried up or were buried under the landslides. The predominantly gravity-fed water supply systems were disconnected or completely destroyed. Landslides also made it difficult for communities to reach springs and water sources. Whatever water was available had become polluted with silt and sediments. People were forced to travel long distances to bring water from open and unsafe sources.

As 350,000 people moved to 200 IDP (Internally Displaced Persons) camps

### Widespread Damage

The earthquake caused wide damage to sanitation infrastructure and water supply systems. Over 4,000 public- and community-owned drinking water supply systems, 25 kilometres of sewerage system as well as drains, public toilets, street pavements and solid waste management systems were partially or totally damaged. Over 50,000 household toilets were also damaged. Water and sanitation facilities in 420 health facilities, and 5,857 educational institutions, were destroyed.

spread over the length and breadth of the nine affected districts, it appeared that a public health nightmare was in the making. Initial assessments indicated that the vast majority of the population was engaged in open defecation which, when combined with the unsafe water, posed a significant health risk. The government, as well as the development community, was faced with the daunting challenge of ensuring safe water and sanitation facilities to the affected population living in camps and in settled areas. A large number of toilets also needed to be set up immediately. Outbreak of epidemics was the nightmare scenario relief workers had to guard against.

In collaboration with national and international development partners, the

<sup>1</sup> USD 1 = PKR 60.58 (as of September 16, 2007). Conversion rates are from [www.xe.com](http://www.xe.com); all conversions in the text are approximate.



Government of Pakistan launched a water and sanitation emergency relief programme. The programme entailed (a) restoration of water supply systems; (b) treatment of water through filtration plants; (c) supply of packaged water; (d) provision of water in camps through tankers, laying of distribution system and provision of storage tanks; (e) chlorination of water supplies and water quality monitoring; (f) distribution of water filters, water purification tablets and sanitation kits; (g) construction of toilets, bathing facilities and washing areas in camps; (h) solid waste disposal in camps and urban areas; and (i) hygiene promotion campaigns.

A number of innovative initiatives were taken during the emergency phase. A huge number of jerry cans, 3,000 Neurox water filters and 200,000 sanitation kits containing essential sanitary items were supplied to the disaster-affected people. To guard against open defecation, over 66,000 pit toilet slabs were also supplied. No less than 1,300 water supply schemes were repaired on an emergency basis soon after the earthquake.

The emergency relief phase ended in July 2006. The host of international and national relief and development agencies that helped in the aid effort as well as the government could congratulate themselves on the fact that there was no major outbreak of water- and sanitation-related epidemics. Rather, the statistics show a decrease in water-borne diseases as compared with the pre-earthquake situation.

Even as emergency relief operations were under way, the Earthquake

Reconstruction and Rehabilitation Authority (ERRA) was planning to undertake rehabilitation and reconstruction of water and sanitation facilities, without which life could not be restored to normalcy. Such planning, first, required a huge assessment exercise to take stock of the damage that earthquake had done to WatSan facilities. It was a significant challenge as many of these water supply systems are located in some of the most inhospitable terrains in the world, where a village may be as high as 10,000 feet above sea level and a visitor may be required to walk on foot for hours or even days.

The earthquake had made conditions even more difficult as roads had disintegrated and dirt tracks had disappeared. Not only this, offices of line departments had collapsed; records, not well kept at the best of times, were simply unavailable. Officials manning line departments and their family members were facing personal tragedies and many had, in fact, passed away in the earthquake. Despite these circumstances, when the emergency phase came to an end and people started returning to their homes, not only had the ERRA surveyed and listed damaged water supply systems, it had also devised a comprehensive 'Strategy for Rehabilitation and Reconstruction of Water Supply and Sanitation Sector'. The strategy is aimed at ensuring that improved water and sanitation facilities are restored to earthquake-affected people in support of the government's policy of 'Building Back Better'. It aims to provide people better water and sanitation facilities than what they enjoyed before the earthquake.



A host of national and international non-governmental organisations (NGOs) had arrived in the disaster-hit region to provide relief and save lives. These organisations had different backgrounds and varying strengths in terms of development. As reconstruction started, many of them left while others moved into sector specific activities. No less than 28 partner organisations stepped forward for reconstruction and rehabilitation of water and sanitation facilities.

The ERRA also offered the development partners the option of taking up any facility that has been listed as damaged and 2,297 water supply and sanitation schemes were pledged by them for reconstruction, out of which 888 schemes have so far been completed benefiting about 600,000 people. These organisations, on their part, mobilised and worked with a large number of community-based organisations (CBOs). The ERRA also offered the development partners the option of taking up any facility that had been listed as damaged – and 1,200 water supply and sanitation systems were pledged for reconstruction.

Sustainability of schemes required that development partners work closely with public institutions. Public departments, however, had no experience of working with international development institutions in such a big way and their resources, stretched even during the best of times, were utterly insufficient to deal with the pace of reconstruction. In the North West Frontier Province (NWFP), for instance, nascent local government institutions were struggling to stand on their own feet.

ERRA's WatSan sector chalked out an elaborate mechanism of co-ordination to harmonise reconstruction activities and clearly spell out the roles and responsibility of all the stakeholders. The WatSan General Advisory Group (GAG) as well as Core Groups (CG) were formed to discuss important issues with all partner organisations and line departments and make the necessary mid-course corrections, if required. Regular GAG and CG meetings helped partner organisations and line agencies understand the policies and procedures as well as share best practices and learn from each other's experiences.

### **Water and Non-water Infrastructure Field Implementation Strategy**

The strategies for involving communities differed slightly from organisation to organisation, though participation was at the root of all efforts. Following is the step-by-step plan implemented by CRS and generally followed by most development partners for achieving a high level of community participation, transparency and ownership of infrastructure projects. The table shows each major step of the process and the skill set of staff required for carrying out the step.



An overwhelming majority of water supply systems, both in the NWFP and Azad Jammu Kashmir (AJK) are 'community-based schemes' – these are the systems where water is provided to communities using a network of pipes and the operation and maintenance is the sole responsibility of the communities. In all, 70 percent of water supply systems in the affected area are communal. In AJK, no less than 99

percent schemes are rural and managed by communities.

The prevalent model in government institutions, particularly in the NWFP, is to outsource construction activity to pre-qualified contractors. These contractors compete in the tendering process and, after winning the contracts, undertake construction activity according to criteria set by the

### Activity

#### Introduction Visit

- Intended to explain project guidelines.
- Formation of Village Development Committee (VDC).
- Communities discuss and agree on community contribution.
- Communities are asked to identify labour.
- Contract types for skilled and unskilled labour are introduced.
- Catholic Relief Services and community discuss donation of water from source owners.

#### Second Community Visit

- Action items from introduction visit are clarified and confirmed.
- Exact skilled and unskilled labour is named, rates negotiated, and terms of contract are discussed.
- Resolutions<sup>2</sup> for non-water projects are collected.
- The viability of the water supply source is verified by the teams and a date for water supply scheme survey is finalised.

#### Technical Survey and Support

- Project feasibility and physical survey is completed with support of the VDC and/or water committee.
- Design, cost and labour estimates are prepared and finalised.
- Line Department approval is obtained.
- Daily activity plan is developed.

#### Memorandum of Understanding (MoU)

- Final agreement on community project is signed in the form of an MoU. This includes:
  - There is agreement on community contribution.
  - Water projects have agreed on material transport and volunteer unskilled labour.
  - Non-water projects have agreed on volunteer labour for one or two days, and possible community support in transport of materials.
- Labour contracts have been signed.
- MoU has been signed by VDC, source owner (if drinking water), land owners (if non-water), and remaining community members.

<sup>2</sup> Resolutions are used for a needs ranking process where communities define their top three priorities for community infrastructure projects. Resolutions are mainly used after drinking water has been excluded as a project and communities must decide between various low-cost schemes.



relevant line department. This model leaves out the benefiting community from the process of planning and construction, thus reducing the element of ownership. Since the community is not involved in the construction, it does not get a handle on the technical aspects of the system and cannot carry out maintenance and management effectively either.

There were added difficulties in reconstructing the water supply systems using the contracting mechanism. Contractors with sufficient skills and experience were in short supply and the cost of contracting had sky rocketed. Many of these schemes were, in fact, located in such difficult terrain that contractors would either be scared to touch them or would charge exorbitant amounts.

#### Material Handover and Tools

- Community VDC and/or water committee members come to warehouse and collect tools and material as per design and goods request voucher submitted by programme.

#### Construction Implementation

- Construction progress is constantly monitored according to construction detailed implementation plans.
- VDC and/or water committee members are engaged and mobilised to hold skilled and unskilled labour accountable.
- All necessary community contributions are collected (for example, sand, gravel, tools, etc)
- Adherence to technical quality, schedules and any further mobilisation of community is ensured.
- Payments are made: 50 percent when project is half complete, and 50 percent at the end of the project.

#### Training

- Community VDC and/or Water committee members are given training on:
  - Scheme operation and maintenance planning.
  - Hard skills delivered by technical staff to maintenance personnel.
  - Fund collection systems put in place.
  - Record-keeping systems established.
  - Conflict prevention and resolution.
- Communities are supported in developing an Operation and Maintenance Plan, as well as given the skill sets necessary to carry it out.

#### Certification and Handover

- Technical visit conducted by technical advisor, and scheme officially approved as complete.
- Handover ceremony with community VDC representatives and water committee (if applicable).



The ERRA advised all development partners to reconstruct water supply systems in partnership with communities. In doing so, they would be building on long-established mechanisms of community participation and, in fact, adding value to the social capital of the communities. For centuries, Himalayan communities have worked in concert to prepare and maintain water

channels and they also work collectively on a number of agricultural activities, where no payment is expected for extending labour and resources. In Kashmir one such custom is called *latri*, while in Pashtun areas of the NWFP one such practice is termed *kalang*.

However, these were not normal circumstances. The earthquake had not

### The Springs of Khangiri

“The earthquake shattered our lives and our water supply system. We could not access the springs due to landslides and we had to use polluted water. We and our children were falling ill every other day,” says Sardar Alam Din, a resident of Khangiri, a village located on a 9,000 feet high mountain in Balakot sub-district of district Mansehra.

The 6,400 residents of Khangiri went through a traumatic period after the Himalayan earthquake. The water supply system of the village was built with self help in the 1970s and was only partially functional even before the earthquake. When this system collapsed due to the earthquake, people found that even carrying water from springs was not an option as landslides had blocked their path. People had to rely on small seasonal springs that would sprout after the rainy season but run dry in the winter. These seasonal springs are not only an unreliable and insufficient source of water; their waters are also usually contaminated.

Oxfam GB (Great Britain) found in an initial survey that almost the entire water supply system – from the source tank to the distribution system – was in need of immediate repair. The field staff observed that the pipes from the source (located 10,000 feet above the village) to the source tank and then from the source tank to the storage tank were either buried or missing due to continuous landsliding after the earthquake. Laying the pipe system though this area was not easy.

Oxfam undertook the responsibility for rebuilding Khangiri’s water supply system and supported the community organise itself by reactivating a resident community-based organisation, which had been dysfunctional for some time. The villagers gathered and resolved to work with Oxfam in redesigning and rebuilding the water supply system.

The population benefiting from the system is scattered in six clusters, so six distribution tanks were designed. The source was also properly protected from all threats of contamination, and a collection tank was built to reduce the probable



only demolished physical infrastructure, it had also impaired the social fabric of the affected communities. People were faced with a great tragedy, perhaps the greatest in living memory. They had lost some of the most resourceful members of the community and the rest were distressed by the emotional trauma that impairs human ability to take initiatives. As normally happens at such times, their

eyes were fixed on individual and family needs rather than on community issues. At the same time, putting them to work jointly in reconstruction would be an excellent way to reclaim the community spirit and revive people individually.

Disputes over the ownership of natural resources is a fact of life in these communities. Such issues surface with

shortfall in the summer. The water discharge was checked and was also tested later.

During construction, best quality standards were maintained. The tanks were constructed with RCC (or reinforced cement concrete) and ensured to be earthquake-resistant. Similarly, all piping was done with good quality GI (or galvanised iron) pipes. In the initial design, about 86 tap stands were proposed to benefit everybody, without any discrimination. The community, however, wanted to have taps inside each home. Staying within the budget, all houses were provided the facility of running water.

To ensure the quality of water provided to Khangiri, water quality tests were performed by using *Del Aqua* kit. The water samples were randomly collected from the village's source tank, storage tank and distribution lines. Water was analysed for pH (acidic or basic), hazardous metals, hardness and bacterial contamination.

The whole process was carried out with the active involvement of the community from the first step to the last. "We were involved in designing, in planning and in construction. We carried construction material from thousands of feet below to the construction site and we provided labour," says Mohammad Fareed, a teacher, proudly.

Today the system is being maintained by a community technician who was trained on-site. The community is also aware of health and hygiene issues due to an extensive hygiene promotion programme run by Oxfam. "Nobody has benefited from this scheme more than women," says Mubarak Jan, a mother of four. "Rather than carrying water from three miles up the mountain, we can now sit back and take care of our children, our cattle and our husbands," she says with a smile. Khangiri's link with its lifeline, the springs, has been revived again and life goes on, in many ways better than ever before.



## Doing Their Own Work in Nallah Sattar Karian

After the earthquake, even washing one's face with soap and water was a luxury in Nallah Sattar Karian, a village located 31 kilometres from Muzaffarabad in the Jhelum valley. The water supply system that provided water to the village had fallen into disrepair even before the devastating earthquake, but now even the springs had become erratic and out of reach. "Our children had to wait for a week before they were taken to the river for washing. Our water was polluted; the families were getting ill again and again" says Kausar Parveen, a mother of four.

When water becomes scarce, women have to suffer the most. In Sattar Karian, women had to carry water in pots from a spring located so high that one round trip could take up to five hours. As one pot was insufficient for the needs of the family, the whole family had to be involved in this job and life now revolved around fulfilling the basic need for water. "You had to reach well in time as water from the spring could be got only in order of arrival at the spring," says Manzooran, a mother of five.

Along with the ERRA, the Mercy Corps pledged to work with the community for the reconstruction of the scheme. A Water, Sanitation and Hygiene (WASH) committee was formed and the villagers decided to change the source of their water to a new spring.

A conflict emerged when one person, from whose land the pipeline had to pass, insisted that he be given a connection from the feeder line. "As a rule we do not provide connections from the feeder line," says Rashid Mehmood, Social Mobiliser. This issue, however, was soon resolved by the community.

Villagers themselves worked on the construction and provided the unskilled labour force. "We made a list and asked everyone in turns. Those who did not want to work themselves were required to pay for a labourer," says Abdul Latif, President of the WASH committee. Villagers also paid for the labourers who were hired from outside the village.

The water supply system is now complete and operative. Villagers have hired a plumber to take care of the system and make sure that water is supplied to everyone equitably. Not only this, the villagers – with support from Mercy Corps – have established toilets in every home as well as in the school and the mosque.



full force whenever any development activity takes place, since one way of asserting ownership over natural resources is the ability to stop any development activity related to that resource. However, communities are also endowed with social resources for dealing with these conflicts, or at least circumventing them, for the purpose of a particular development activity.

Development organisations are not unfamiliar with these issues; their biggest strength lies in working with communities. They started by conducting baseline surveys and carried out social assessment using participatory methods including map-building, joint action planning and focus group discussions with women, men and children. An effort was made to integrate women in water and sanitation activities, such as designing a water scheme, toilet location and signing a Memorandum of Understanding with the community.

Development partners followed an integrated public health improvement model with a sharp focus on creating

local social infrastructure, building its capacity and linking the community with local government institutions. Communities were encouraged and supported to form CBOs. Formation of user committees was also facilitated around rehabilitated schemes to ensure sustainability through proper and regular operation and maintenance. The capacity-building of the community involved both 'soft' and 'hard' parts. On the 'soft' side, committees were formed and trained in the basics of management as well as health and hygiene. Community technicians were also selected as caretakers of the scheme and were trained while schemes were being constructed. These technicians take over the responsibility of running the scheme after the work is complete. The 'hard' side involved constructing the scheme and providing tool kits to enable community technicians carry out necessary maintenance after completion of the schemes.

In order to bring change in terms of hygiene and sanitation, most development partners used a methodology called 'Participatory



Hygiene And Sanitation Transformation' (PHAST), which is an innovative approach to promote hygiene, sanitation and community management of water and sanitation facilities.

PHAST aims to empower communities to manage their water and to control sanitation-related diseases, and it does so by promoting *health awareness and understanding* which, in turn, leads to environmental and behavioural improvements. PHAST uses methods and materials that stimulate the participation of women, men and children in the development process. It relies heavily both on the training of extension workers and on the development of graphic materials (sets of which are called 'tools kits') that are modified and adapted to reflect the cultural and physical characteristics of communities in a particular area.

The capacity-building of communities took many forms. Oxfam, for example, carried out identification, selection and training of community motivators and linked them with the Health Department through Lady Health Workers. It carried out training sessions with hundreds of community motivators on participatory methods and relevant public health issues. Under Child-to-Child approach, the United Nations International Children's Emergency Fund (UNICEF) and its partners trained 3,500 teachers in School Sanitation and Hygiene Education that resulted in 200,000 children being educated in basic hygiene education messages.

Based on PHAST, development partners delivered key hygiene

promotion messages that included maintaining a clean chain of drinking water from source to mouth, safe excreta disposal through use of toilets by all family members including children, and handwashing at critical times.

The ERRA and its development partners worked overtime to 'Build Back Better'. They aimed at building better water supply systems than the ones people had before the earthquake, making communities more informed and conscious of health and hygiene and also inculcating better health practices.

The unavailability of sufficient quantities of water is a serious issue facing the communities in Himalayan regions. In most instances, the capacity of gravity schemes was increased during the rebuilding process either by capturing new spring sources or by replacing the main supply pipelines where the existing pipelines had insufficient flow. However, in some cases the existing mainlines were simply repaired to restore them to their previous supply capacity. Where required, the system capacity was worked out to cater for a future population at a growth rate of 3 percent per annum for the next 15 years. After completion, most water supply systems have a per capita daily provision capacity equal to or above the target figure of 40 litres. However, this has not been possible in systems where there is not enough water at the source.

Quality of water is yet another concern for communities all over the country. Before the earthquake, water quality was an issue line departments were not much bothered about and



communities were not conscious of. The ERRA and its development partners have tried to build the capacity of line departments for testing water for contamination. The ERRA has arranged orientation sessions and technical training programmes for line department officers on the issue of water quality. To equip line departments with the means to test the water quality, 10 modern laboratories are being set up and field testing kits and other necessary tools and equipment have been distributed.

As the ERRA strategy demands, on almost all schemes, a pre-implementation water testing survey was conducted and water was tested again after completion of the schemes. According to the results of these pre-completion tests, most of the existing (open) sources were found to be contaminated and bacteriological counts of 5 to more than 100 E.coli/100 ml were obtained.

Post-implementation water testing exercise sampled water both from selected tap stands and from containers of adjacent houses. The household samples were meant to examine the effects of transportation and storage and to explore the risk of recontamination. The available test results show satisfactory quality of water at the tap stand with no faecal contamination (0 E.coli/100 ml). However, some minor contamination was observed in some households' containers.

The issue of quality, however, demands longstanding commitment from policymakers and relevant line departments. Concerted efforts will be required in future to keep water sources and supply systems safe from contamination and to educate communities about health and hygiene. The ERRA is working closely with the Pakistan Council of Research in Water Resources and the Clean Drinking Water for All Programme of the Ministry of Industries to ensure the supply of clean drinking water to communities on a sustainable basis. To deal with a perennial shortage of water, rainwater harvesting needs to be made a norm.

Today hundreds of villages are buzzing with life once again, children are clean and healthy and for women there is no more the drudgery of carrying water from miles away – because there is running water in their taps. Endowed with better health and with more time at their command, families can explore new avenues for individual and communal development. Girl children, free from the rigorous labour of carrying water, can now go to school and concentrate on learning, women can now give more time to their children and learn new skills to participate in economic activities. Once the most basic need for water is satisfied, the community becomes ready to take a leap forward.



## Acronyms and abbreviations

AJK	Azad Jammu Kashmir
CBO	Community-based Organisation
CRS	Catholic Relief Services
ERRA	Earthquake Reconstruction and Rehabilitation Authority
GAG	General Advisory Group
GI	Galvanised Iron
IDP	Internally Displaced Persons
LHW	Lady Health Worker
MoU	Memorandum of Understanding
NGO	Non-governmental Organisation
NWFP	North West Frontier Province
PERRA	Provincial Earthquake Reconstruction and Rehabilitation Agency
PHAST	Participatory Hygiene and Sanitation Transformation
PKR	Pakistan rupees
RCC	Reinforced Cement Concrete
SERRA	State Earthquake Reconstruction and Rehabilitation Agency
UNICEF	United Nations International Children's Emergency Fund
VDC	Village Development Committee
WASH	Water, Sanitation and Hygiene
WatSan	Water Supply and Sanitation



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Author: Syed Zaheer Hussain Gardezi  
Lead technical writer: Zaigham Khan  
Editor: Anjali Sen Gupta  
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### Contact Details



**Earthquake Reconstruction  
& Rehabilitation Authority**

Prime Minister's Secretariat (Public),  
Islamabad

Tel.: +92-51-9030967, 9030921

Fax: +92-51-9030949

Website: <http://www.erra.gov.pk>

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